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EDITOR'S MESSAGE

by John Gross

Well, last time I mentioned that it was slowing down a bit on the LightWave front. This month, that description couldn't be more wrong. *Lots* of things have happened, and I don't have much space to talk in this issue, so let's get to it....

NewTek Systems Group: NewTek and DeskStation Technologies have announced their joint venture (NSG) to create and sell RISC-based systems for LightWave and future hardware/software products. They also revealed that Alpha-based LightWave would go up in price to $1,995, and that NSG would be its exclusive distributor. SGI LightWave continues to be sold through Xaos Tools, and Intel-based LightWave through existing channels. I know people will disagree with me, but personally, I have no problem with the news about Alpha-based LightWave, as I feel that LightWave in general was "underpriced" to begin with. I am always in favor of NewTek making more money to further the advancement of LightWave and other cool products. It will be interesting to see what the company has in mind for NSG systems down the road.

HIIP: The first releases of Intel-based LightWave included not-so-functional HIIP image loader/savers. Many of the RGB savers functioned, but none of the Alpha savers did. To top it off, HIIP pads out any non–24-bit images loaded to 24-bit. For example, a 1-bit black/white image (640x400) used to come in as 32K (at 1-bit). Under HIIP, it would come in as 768K in size and 24 bits! Ouch. To circumvent this problem (until a fix is made available), you can simply rename the IFF.exe file located in the HIIP\Loaders directory. Once you do, the HIIP IFF loader will fail, causing LightWave's internal loading scheme to be called.

AVI saving and missing dll's: Many users have discovered that AVI saving has not worked. The problem stems from the fact that the

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This month's cover shows a single-person Specter Sub-Fighter from seaQuest 2032. *The object was built and textured by Greg Teegarden, with additional help from Eric Barba. Modeler's Metaform function helped create the Specter, which consists of two objects (the cockpit can eject in emergencies) totalling 67,520 polygons. Image courtesy Amblin Imaging, copyright © 1995 Universal Television & Amblin Entertainment.*

Let It Pour!

Simulating Pouring Water With LightWave

by David Warner

One of the best things about asking questions regarding a particular animation challenge on the LightWave newsgroup or LightWave mailing list is that you will typically end up with numerous responses that will provide you with many different options.

Recently, someone asked what the best way would be to animate pouring water in LightWave. Though there were a few very good replies, none of them were really all that detailed. So I took it upon myself to sit down and actually try to simulate water pouring from one glass into another.

To get an idea of what is involved here, pour some water from one glass to another. It's a simple thing that we do many times a day, but there are a lot a steps we need to take to simulate this effect realistically in the 3D environment. It would be much easier to create the illusion if we used non-transparent water container objects, but I think the animation looks much better when you can actually see the liquid leave one container and flow into another.

This animation will require a total of eight objects: two containers (one to pour water out of, one to pour water into); two water objects that will stay within each of these containers; three morph targets for our first water object; and another water object that will actually "pour" from the first container into the second container.

Modeling the Objects

Our first step is to model a container to pour the water from. Run Modeler and, using the comma (,) key, zoom in until the grid size equals 50 mm.

- Start by creating a polygon that looks like the one in Figure 1. Copy the polygon to a new layer and **Lathe** it 360 degrees around the Y axis (center at 0, 0, 0) with 32 sides. Then, use the **Magnet** tool (**Modify** panel) to pull out the lip of the container to form a pour spout that points toward the +Z axis.
- Select a new layer and use the **Sketch** tool (**Objects** panel) to draw a curve where the handle should be.
- After selecting a new layer, choose the background layer with the curve that you just sketched. Position a **Disc** (**Objects** panel) at the beginning of the curve. Make sure it is aligned to the curve so the plane of the disc is "perpendicular" to the start of the curve. Click on the **Rail Ext** button (**Multiply** panel) and highlight the **Uniform Lengths** button. Click **OK**. The water container should now have a handle.
- Use the **Surface** button (**Polygon** panel or q) to name the polygons of your water container and the handle. I used the names "WaterContainer" and "WaterContainerHandle". Hold down the shift key and select the two layers that contain these objects. **Save** or **Export** (**Objects** panel) these two layers as "Contnr1.lwo", the object that water will be poured out of. **Save** or **Export** another copy of these two layers as "Contnr2.lwo" so that we will have an object for the water to pour into. Our completed water containers should look like the object shown in Figure 2.

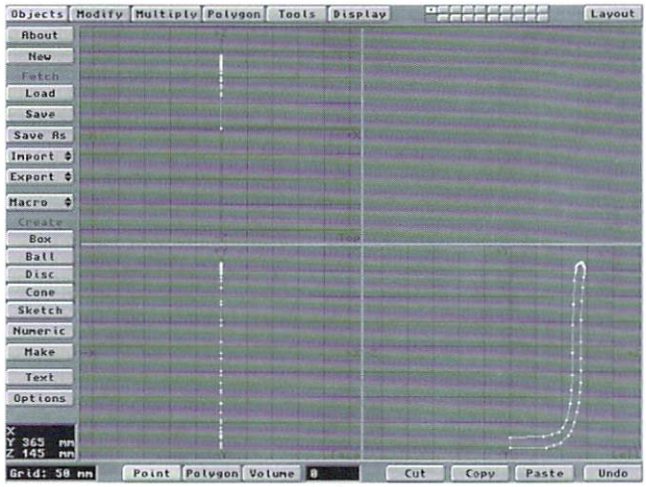

Figure 1: The initial polygon shape for the water container object.

Now we need to model our water objects. There will be three different objects, two of them with multiple morph targets. We'll start with the water that will pour out of the container.

- With the water container object in a background layer, use the **Points** tool (**Polygon** panel) to create a polygon that matches the shape of the water container bottom (Figure 3). Use the **Lathe** tool (**Multiply** panel) with 32 sides and alignment set to the Y axis to form the basic shape of our water object. (If you want to be exact, you can select the points that form an inside edge of the container and lathe it to obtain a perfect fit.)
- Press the (w) key and select all of the polygons in

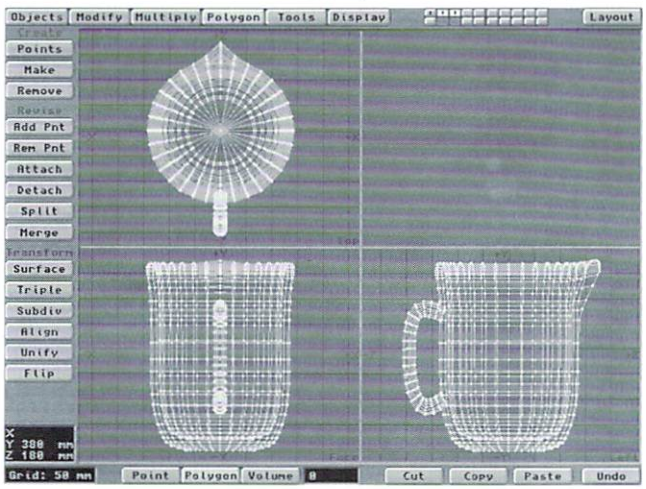

Figure 2: The completed water container object.

this object to make sure that they are pointing outward. If they're not, click on the **Flip** button (**Polygon** panel or f) to align all of the polygons correctly. Now click on the **Triple** button (**Polygon** panel or T) to make all of this object's polygons triangular (because we will be morphing its shape), and then use the **Surface** function (**Polygon** panel or q) to name the polygons in this object "Water".

- **Save** or **Export** this object as "Water1.lwo". It will be used as the morph source object for the water that will pour out of "Contnr1.lwo". **Save** or **Export** another copy of this object as "WaterB1.lwo", which will be used for the water that is poured into "Contnr2.lwo".
- Select the **Stretch** tool (**Modify** panel or h), and with the center of the tool positioned at the bottom of your water object, double the height of the water object along its Y axis. Select the **Taper2** tool (**Modify** panel), and with the center of the tool positioned at the bottom of the water object in the Face (XY) view, taper the shape of the object down to .1 on the Y axis only. Next, select the **Stretch** tool again and resize the tapered water object by .9 along the Z axis to make the object fit better into the bottom of the water container. Your values may differ slightly depending on the shape of your object.
- To save some memory, click on the **Remove** button (**Polygon** panel or k) to eliminate all of the polygons from this object in order (morph targets only need to contain points if you are using **Surface Morph**). You should end up with an object that looks like the one in Figure 4.

You may have noticed that the tapered water object is facing the "wrong" direction. Don't worry—we will correctly orient the water objects in Layout.

- **Save** or **Export** this object as "Water2.lwo". It will be the first morph target for our water object.
- For our second water morph target, select the **Pole2** tool (**Modify** panel), click on the **Numeric** button (n), highlight the X button and type in the following values:

Radius:	0, 330, 380
Center:	0, 45, 200
Factors:	1.0, 1.0, 0.5
Center:	0, 40 , -150

- Click **Apply** to make the change and then select (n) again and apply them once more to reshape the water object even further.
- Select the **Taper1** tool (**Modify** panel). With the center of the tool over the bottommost edge of the object, as seen from the Top (XZ) view, **Taper** it by a factor of .5. You will have to **Move** (t), **Rotate** (y) and **Stretch** (h) (**Modify** panel) the object a little so that it fits correctly within the water container, but you should end up with the shape displayed in Figure 5. **Save** or **Export** this object as "Water3.lwo".
- To make the final morph target for our water object, all we need to do is select the Size tool (**Modify** panel or H) and center it over the highest point in our object, as seen from the Left (YZ) view. Resize the object by a factor of 0 so that the only thing visible is a single point. **Save** or **Export** this object as "Water4.lwo".

Once the morph envelopes have been set up correctly, these three morph targets will make our water object "pour" out of the water container until it is empty. We still need to model objects to show where the water is going as it pours out and where it all ends up once it is done flowing.

Now we'll model the water object that will actually pour out of the first glass and into the second.

- Select the **Disc** tool (**Objects** panel) and draw out a shape that is aligned to the Z axis with one centered end at 0, 0, 0 and the other end extending to 0, 0, 1. Select numeric or press (n) and set the number of segments to 10 along the Z axis. Click on the **Make** button (return).

You should now have a 1-meter-long tube that is aligned to the Z axis and has segments at every .1 meters.

- Highlight the two polygons on each end of the tube and select the **Bevel** tool (**Multiply** panel or b) in preparation for making three bevels to round off each end of the tube.
- For the first bevel operation, enter 1 for **Inset** and 3 for **Shift**. For the second bevel operation, enter 3 for **Inset** and 2 for **Shift**. And for the final bevel operation, enter 5 for **Inset** and 1 for **Shift**. Now select all of the polygons, name the **Surface** (q) "WaterPour", and **Triple** and **Subdivide** (**Polygon** panel) all of these polygons twice. **Save** or **Export** this object as "WaterPour.lwo".

We are now finished modeling the objects necessary for this tutorial, so let's return to Layout.

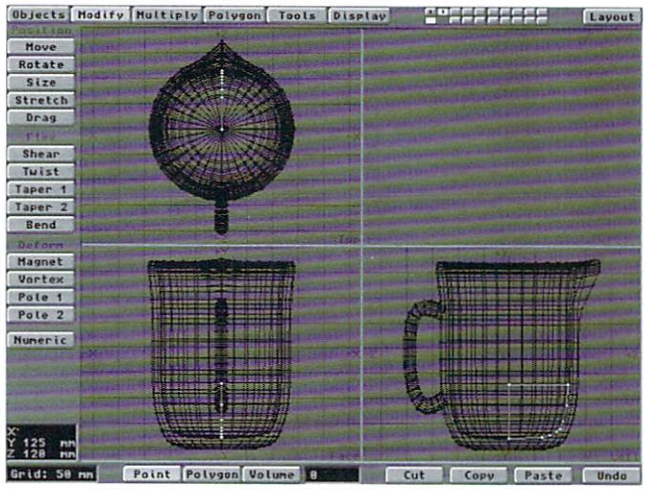

Figure 3: The initial polygon shape for the water object.

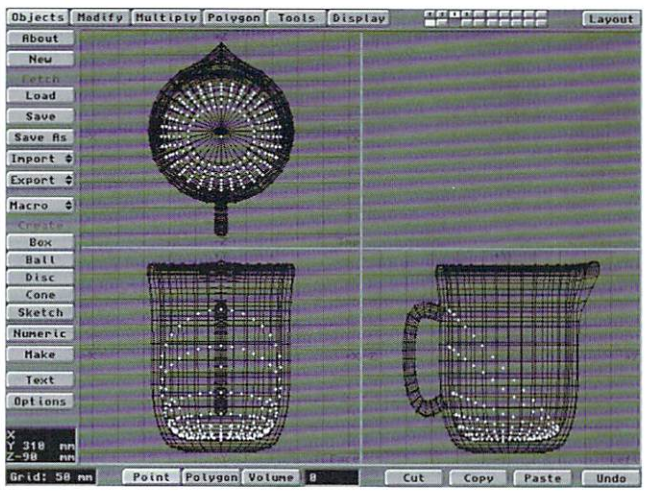

Figure 4: The first water morph target, minus polygons.

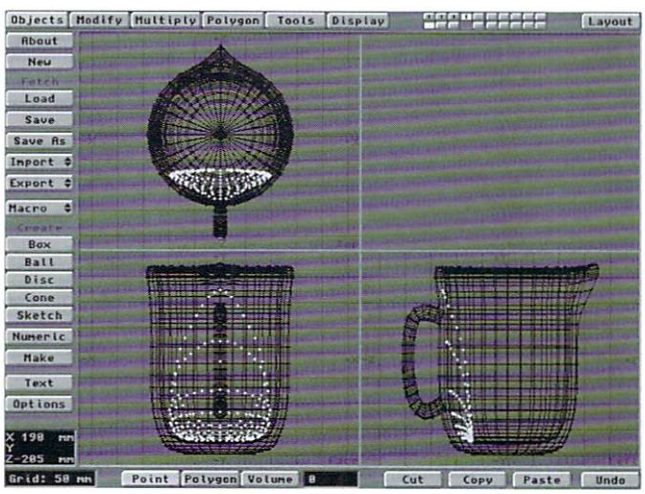

Figure 5: The second water morph target.

Setting Up the Scene

We will be making a scene that is approximately 12 seconds long, so in the **Scene** panel set the **Last Frame** to 360. If you haven't been exporting your objects to Layout during the modeling part of this

See Let It Pour, page 8

LightWave 101:
Basic of Splines, Part I

by Adam Chrystie

Enter the wonderful world of splines! Splines are useful for the creation of objects that have no apparent joints and objects whose shapes alter with no visible hard edges. In this month's lesson, we will be creating a simple mountain object.

The Rules of Spline Creation:

(1) A spline is made up of three or four curves that overlap to define a closed area.

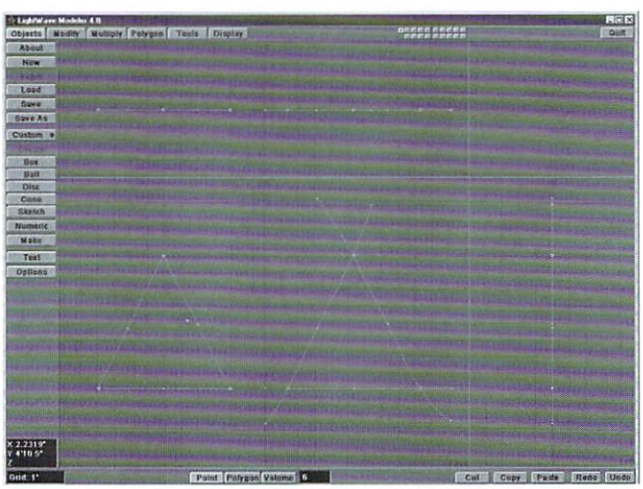

Figure 1

I try to avoid using more than four curves to define an area because the location of Modeler's patching is unpredictable. (You cannot select 10 curves and expect Modeler to patch all 10 sections. You must patch each section separately. Bummer! But have no fear. At SIGGRAPH, a NewTek employee I spoke with said the company was working on an autopatcher.) Always try to patch with four curves. If you patch with three curves, a visible crease may show along the shared axis of the patches. In the follow-up article, I will explore some methods for working around this drawback.

(2) The curves must be connected to each other somewhere along their lengths, which helps Modeler define the physical area where the patch will occur. These points must be fused together either by an Automatic or Absolute **Merge** (**Tools**) (m). You can also use the **Weld** (**Tools**) command (Ctrl–v in 4.0). The bottom line is that your curves must share actual points. The test is simple: Select a point where the curves appear to intersect. Now **Move** (**Modify**) (t) the point. If both curves alter their form, then the point is shared by both. If only one curve is affected by the point's movement, then the points were not shared. In this case, you would need to do a merge points or weld them together.

(3) When patching, you must be in **Polygon** Select Mode (bottom of Modeler screen) and you must select the curves that will define the patch.

(4) To patch the selected curves, hit the **Patch** (**Multiply**) (Ctrl–f) button and fill in the required numerical data. I'll discuss these fields a little later in this article.

Figure 1 shows two proper examples of splines that are about to be patched. The splines on the left have their points merged at the endpoints. The curves on the right overlap at points in between the endpoints. These examples illustrate how the patch area is created as a result of the locale of the overlapping points. I have selected the points where the curves are merged in order to make them more visible. Remember, when patching you must be in Polygon mode (at the bottom of Modeler's screen) and manually select the curves.

Shall We Spline Tonight?

Armed with this basic knowledge, let's make something before we move on to more advanced topics. So far, the splines in the images have been boring and flat. The main purpose of splines is to create nice, smooth 3D objects. So let's build a simple mountain-type shape. You could make one using three curves. I chose to slice my mountain into a few sections to give it a more controlled form.

- Make the front profile of the mountain in the front view by plotting points. Place the first point at Y = 0. The last point should also be at Y = 0. Use the **Create Points** (**Polygon**) tool to make the outline. Select the points from left to right or right to left and use **Make Curves** (**Tools**) (Ctrl–p). Now our object has guidelines for the X axis and the Y axis. Take a look at the figures for a rough idea of the shape. Try to mimic the curve that lies in the X–Y planes.
- Next, we need to define the base profile of the object. Again, we'll use **Create Points** (**Tools**) to make this outline. But first, click on the farthest lower left point of the mountain in the face view. LightWave will now have this point's location in memory. Why do we do this? To create the base profile, we will be working in the TOP view. Only the X and Z axes are in this view. By clicking on the lower left mountain point, we set Y to zero. Hence, when we work in the top view, all points that are created will position themselves at Y = 0. Proceed to create the base profile.
- Before you make this curve, deselect all the points you just created. Now go back and select the base points, beginning with the original point that was used to set Y = 0 and finishing with the point farthest to the right. Now you can turn these points into a curve by using **Make Curve** or (Ctrl–p). Both curves should share endpoints on their left and right sides. You should have something that looks like Figure 2.

We've created the base form and a vertical profile. Now we need to make some depth data for the mountain. We could use one curve to do this, but it would be a very boring object. Instead, we are going to use two curves, and we'll have to do multiple patches to complete the object.

- One curve should be built using the above steps between the left side and the middle of the object. The other curve should be between the middle and the right side of the object. The goal is to create two curves that join the top of the mountain to the

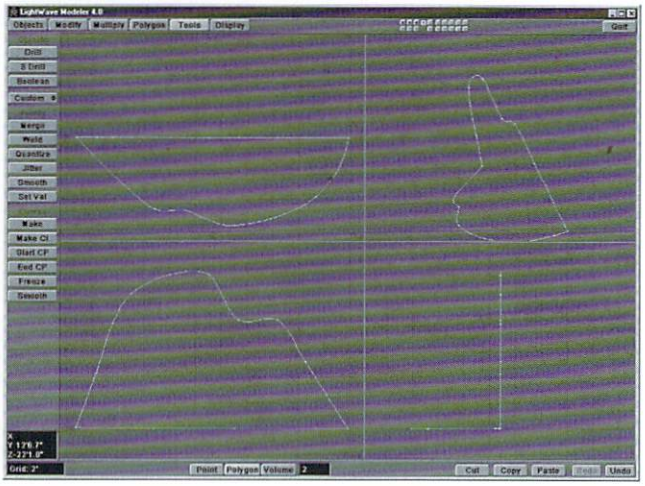

Figure 2

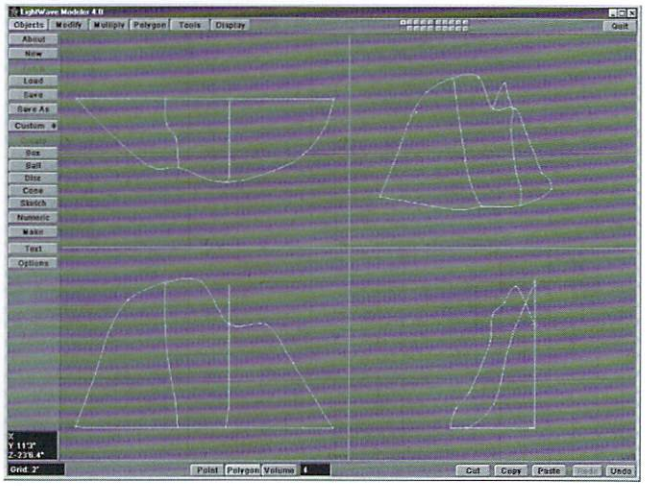

Figure 3

bottom of the mountain. Try to give the points some variation in their Z positions. The Z position of these curves will add ridges to the mountain. Remember to use the Top or Left views to set your Z position before you create the points. Use the Front or Left views to set the Y position for the points. Make sure that all points are aligned along their X axis. (Hint: They do not have to be perfectly aligned. We don't want the points to have too much variation between their X coordinates because you'd get a rather funky-looking patch. And if something looks funky in Modeler, it will look four times as funky when it's rendered.)

- Again, use **Create Points** to make the points and **Make Curve** to make the curve. Did you remember to highlight the points on the very top and extreme bottom of the mountain? If you forget to include them, the curves will not be sharing common points, and you'll have to deselect the points, reselect them in order (top to bottom or bottom to top) and then re-create them. You should have something that looks like Figure 3.

This is the way to go. You want to design your object so it can consist of many individual spline curves and sections of curves. In Part II, we'll apply this method in building a more complex object, a hand splint.

We're now ready to use the Patch (Multiply) (Ctrl–f) command. You must be in the Polygon Select mode to select the curves. The order of curve selection is important! The Patch operation makes the mesh's polygons converge in the direction perpendicular to the last curve selected. Say what? In other words, the Parallel and Perpendicular settings in the Patch requester are relative to the last curve selected. Let's take a look:

- Select the Base profile curve.
- Select the farthest left Depth Profile curve.
- Select the Shape Profile curve.
- Use the Patch command with settings at 10 for Parallel and Perpendicular. Also highlight Length for each.
- Click **OK**. Modeler should have made a patch on the left side of the mountain. If the patch was made on the right side, click on Undo. Then, push (f) for Flip Polygons and redo the above three steps.

If you've proceeded correctly, the result should not look good. Did you notice how the polygons tend to group together at the lower right section of the patch? Also, the mountain seems to have no real defining form at all. I get dizzy just looking at it. Here's the cure. We want the polygons to be grouped horizontally across the surface. Well, which curve is going to do this? That's right! The Vertical Depth curve that connects the base to the top of the mountain. You must make sure to select these vertical depth curves last. The order in which the other curves are selected is irrelevant. So undo that patch and select (in order) the Base curve, Profile curve and Vertical Depth curve.

Now, let's patch the middle section:

- Select the Top curve.
- Select the Bottom curve.
- Select the Left Vertical curve.
- Select the Right Vertical curve.
- Select Patch and use the same settings as before.

Now, we're going to patch the right side:

- Select the Top curve.
- Select the Bottom curve.
- Select the Right Vertical curve.
- Select Patch (Multiply) and use the same settings as before.
- If no new patch appeared, push Undo, and then hit (f) for Flip Polygons and try to patch it again.

When you're finished, you should have something that looks like Figure 4. If you received an error stating that the curves did not cross properly, go back and make sure that every curve is physically connected. Merge or weld points where necessary.

What About That Patch Requester?

One of the best features about splines is that you are able to have a large influence over the amount of polygons used during the creation of the object. This is what the Patch requester is all about. The requester's numeric fields are asking you how many divisions to use when building the object. We can make a patch with 100 parallel segments and 20 perpendicular segments if we wish. Remember that these data fields work in relation to the last curve selected. In our example, the last curves selected were always the vertical curves that attached the top and bottom of the mountain.

Let's give our object more vertical polygons:

- Undo the last patch.
- Select the curves in the proper order.
- Go to Patch and increase the perpendicular field. Now there should be more polygons traveling across the object's Y axis.

The Length option tells Modeler to make the subdivisions evenly spaced during the Patch operation.

see LightWave 101, page 15

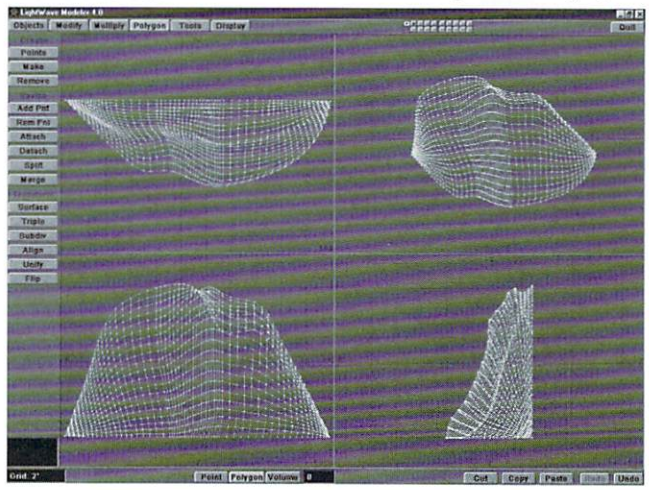

Figure 4

Let It Pour

continued from page 5

tutorial, use **Load Object** (**Object** panel) to import all of the objects that were just modeled.

Now, let's set up the initial positions for all of our objects.

- Go to the Layout screen. Select the "Contnr1.lwo" object, highlight **Move Pivot Point**, click on the **Numeric** Input button and enter 0.0, 0.265, 0.135 for X, Y and Z. This will change how the object rotates as we pour the water from it.
- Select **Move** and change its position to .5 on the Y axis and 0.1 on the Z axis. Make a keyframe at frame 0.
- Now, select the "Water1.lwo" object, **Parent** it to the "Contnr1.lwo" object, **Rotate** it 180 degrees around the **Heading**, and make a keyframe at frame 0.
- Choose **Move** for the "Contnr2.lwo" object, change its position to -0.025 on the Y axis and 0.135 on the Z axis, **Rotate** it 180 degrees around its **Heading**, and make a keyframe at frame 0.
- Select the "WaterB1.lwo" object and **Parent** it to the "Contnr2.lwo" object.

Let's set up all of the dissolve envelopes now.

- Go back to the **Objects** panel and set **Object Dissolve** to 100% for the "Water2.lwo", "Water3.lwo" and "Water4.lwo" objects.
- Open up the **Object Dissolve** Envelope panel (E) for the "Water1.lwo" object and make one keyframe at frame 270 with 0% dissolve and another keyframe at frame 280 with 100%. Tap **Use Envelope**.
- Open the **Object Dissolve** envelope panel for "WtrPour.lwo" and change frame 0 to 100%. Make a keyframe at frame 170 with 100%, a keyframe at frame 180 with 0%, a keyframe at frame 340 with 0%, and a keyframe at frame 350 with 100%. Click **Use Envelope**.
- Open the **Object Dissolve** envelope panel for "WaterB1.lwo" and change frame 0 to 100%. Make a keyframe at frame 240 with 100%, make another at frame 245 with 0%, and then hit **Use Envelope**.

Next, we'll set up all of the morphs.

- From the **Objects** panel, choose the "Water1.lwo" object, set its **Metamorph Target** to "Water2.lwo", and open up the **Metamorph Amount** envelope panel (E). Create a keyframe at frame 30 with 0%, click the **Spline Controls** button(s), highlight **Linear** and click **OK**. Make another keyframe at frame 120 with 100%, and then click **Use Envelope**.
- Select the "Water2.lwo" object, set its **Metamorph Target** to "Water3.lwo", and open up the **Metamorph Amount** envelope panel. Create a keyframe at frame 120 with 0%, click the **Spline Controls** button, highlight **Linear**, and click **OK**. Make another keyframe at frame 210 with 100%, and then click **Use Envelope**. (Yes, this is a bit repetitive, but it's very necessary.)
- Choose the "Water3.lwo" object, set its **Metamorph Target** to "Water4.lwo", and open up the **Metamorph Amount** envelope panel. Create a keyframe at frame 210 with 0%, hit the **Spline Controls** button, highlight **Linear** and click **OK**. Make another keyframe at frame 270 with 100%, and then click **Use Envelope**.

Now that all of the morphs are set up properly, save your scene file.

It's time to set up the water object that will actually "pour" out of the first water container and into the second.

- Select the "WtrPour.lwo" object in the **Objects** panel, click the **Displacement Map** texture button (T) and select **Fractal Bumps** for the **Texture Type**. Click the **Texture Size** button and enter 0.01, 0.01, 0.03. Hit the **Texture Velocity** button and enter 0.005 for Z. Set the **Texture Amplitude** to 0.005 and keep the number of **Frequencies** at 3. Click **Use Texture**.
- Open up the **Object Skeleton** panel for this object, and click the **Add Bone** (not **Add Child Bone**) button 10 times. Change the **Bone Rest Length** to 0.1 for all 10 of these Bones. Finally, click **Continue** and return to Layout.
- Parent the "WtrPour.lwo" object to the "Contnr1.lwo" and take a look at the scene from the Top or XZ view. You should see the "WtrPour.lwo" object highlighted and sticking straight out along the Z axis with one end centered at the middle of the "Contnr1.lwo" object.
- Select **Bone** (B) from the **Edit** section. Beginning with Bone (2), move each Bone .1 meters along the Z axis, away from the Bone preceding it, and make keyframes at frame 0 for each Bone after you move them. So Bone (1) will be positioned at 0, 0, 0, Bone (2) will be positioned at 0, 0, 0.1, Bone (3) will be positioned at 0, 0, 0.3, etc. Once you have all the Bones keyframed and lined up properly along the "WtrPour.lwo" object's Z axis, press the (r) key to set each Bone's rest position and make it active.
- **Move** the "WtrPour.lwo" object to 0.0, 0.285, 0.115 and **Rotate** it 70 degrees around its **Pitch** axis so that the object is just inside the pour spout of the "Contnr1.lwo" object. Make a keyframe for the "WtrPour.lwo" object in this position at frame 0. Compare the Side (ZY) view of your Layout screen with the one in Figure 6 to make sure all of your objects' initial positions are correct.

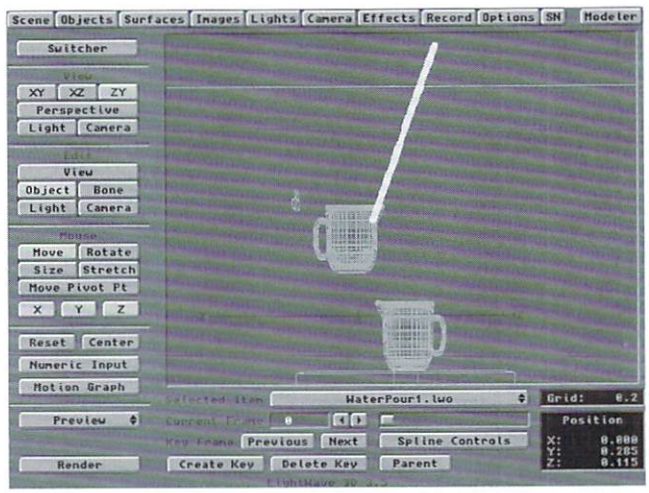

Figure 6: All objects are positioned and ready for animating.

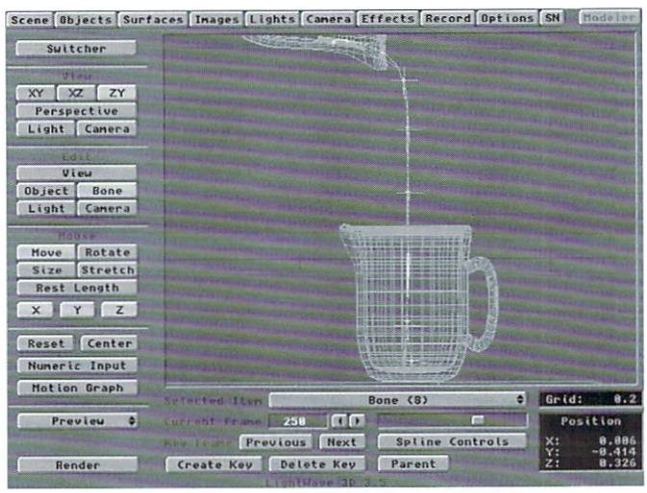

Figure 7: The Bones will need some tweaking so they all follow the same path.

Our next step is to set up new keyframes for the "Contnr1.lwo" object.

- Select the "Contnr1.lwo" object and, at frame 30, make a keyframe. This keyframe will be a copy of the one at frame 0 except that **Linear** in the **Spline Controls** panel is turned on (at frame 30).
- Go to frame 120, **Rotate** the object to 45 degrees around its **Pitch** axis and make a keyframe. Next, go to frame 275, **Rotate** the object to 95 degrees around its **Pitch** axis, make a keyframe, and then open up the **Spline Controls** panel and change the **Tension** to 1.0. *[Editor's note—You can also interactively adjust the spline controls at a keyframe by holding down (t), (c) or (b) while moving the mouse right or left. The Coordinates window will give you numeric feedback. —JG]*

Next, the keyframes for the Bones of the "WtrPour.lwo" object need to be set up so that they move downward into the "Contnr2.lwo" object with a smooth, sloping motion.

- Select the "WtrPour.lwo" object and highlight the **Bone** button. Starting with Bone (10), select **Move** and then **Reset** its position back to 0, 0, 0. Then select Size, click the **Numeric** button and enter 1.0, 0.1, 0.1. Now make a keyframe for Bone (10) in this position for frames 0 and 180.
- Go to the keyframe at 180, open up the **Spline Controls** panel and highlight **Linear**.
- Go to frame 190, **Move** the bone to 0.0, -0.01, 0.095, **Rotate** the Bone to 25 degrees on its **Pitch** axis, change the Bone's **Size** to 1.0, 0.1, 0.5, and make a keyframe.
- Go to frame 200, **Move** the Bone to 0.0, -0.07, 0.15, **Rotate** the Bone to 67 degrees on its **Pitch** axis, and make a keyframe.
- Proceed to frame 210, **Move** the Bone to 0.0, -0.16, 0.185, **Rotate** the Bone to 77 degrees **Pitch,** and change its Size to 1.0, .5, 1.0. Create a keyframe.
- Go to frame 220, **Move** the Bone to the position 0.0, -0.31, 0.235, and **Rotate** the bone to 75 degrees **Pitch**. Create a keyframe.
- Go to frame 230, **Move** the bone to 0.0, -0.45, 0.3, **Rotate** it to 73 degrees **Pitch**, and make a keyframe.
- Advance to frame 240, **Move** the Bone to 0.0, -0.575, 0.375, **Rotate** it to 71 degrees **Pitch** and make a keyframe.
- Finally, go to frame 250, **Move** the Bone to 0.0, -0.645, 0.43, change its **Size** to 5.0, 5.0, 0.1 and create a keyframe.

Whew! If you don't want to go through all of that again (in case of an accident), now would be a good time to resave your scene file.

Next, we need to save the motion path for this Bone and apply it to the other nine Bones in this object, but with an offset of 10 frames for each Bone.

- Make sure that Bone (10) is selected and click on the **Motion Graph** button (m). Select **Save Motion**, type in any file name to save this motion path, and then click on the **Use Motion** button.
- Select Bone (9) from the Layout screen and select **Motion Graph**. Load in the same motion path file that you just saved. Click on the **Shift Keys** button, enter 10 for the **Shift Frames By** value, hit the **OK** button, and then tap the **Use Motion** button.
- Repeat this process for all of the Bones, shifting Bone (8) by 20 frames, Bone (7) by 30 frames, Bone (6) by 40 frames, and so on.

When you're done setting up motion paths for all of the Bones, you will need to tweak them with the **Move** and **Rotate** functions to make each Bone's motion path look exactly the same as the motion path we set up for Bone (10). These tweaks are essential because the "WtrPour.lwo" object is changing position while the "Contnr1.lwo" object rotates. It may be helpful if you add a few nullobjects and use them as reference points to mark the path your Bones should follow, as seen in Figure 7.

Finally, we need to make a few keyframes for the "WaterB1.lwo" object.

- Select this object, go to frame 350 and make a keyframe. Change the **Tension** to 1.
- Go back to frame 0, **Move** the object to 0.025 on the Y axis, change its **Size** to 0.0 on all three axes, make a keyframe at frame 0 and make another keyframe at frame 240. Select **Linear** (**Spline Controls**) at frame 240.
- Advance to frame 255, **Move** the object to 0.02 on the Y axis, change its **Size** to 0.85 on the X and Z axes and 0.2 on the Y axis, and make a keyframe.
- Finally, go to frame 275, **Move** the object to 0.14 on the Y axis, change its **Size** to 0.9 on the X and Z axes and 0.4 on the Y axis, and make one final keyframe.

Finishing Touches

You may also want to add some background objects (a table, some walls, etc.) to complement the scene, but it isn't mandatory. All we really have to do now is change our surfaces:

- Select the **Surfaces** panel. The "WaterContainer" and "WaterContainerHandle" surfaces should both have a very high **Specular Level** (150%) with **Glossiness** set to **High**. **Reflectivity** should be low (5%) with a very subtle reflected Image. **Transparency** should also be very high (95%) with a slight change to the **Refractive Index** (1.03), and **Opaque** edges with an **Edge Threshold** of about 0.65. You'll also want to turn on the **Smoothing** and **Double Sided** functions.
- The "Water" and "WaterPour" surfaces should have very similar settings, except they should be a light blue color, the **Refractive Index** should be set to 1.33, and the **Edge Threshold** should be somewhere around 0.25.
- Finally, position your camera and set up some basic lighting conditions (Key, Back and Fill with little or no **Ambient Intensity**).

Save all of your work, render the scene out and admire the results of your newfound skill. Feeling thirsty yet?

Despite the length of this tutorial, I could suggest a few additional things to make this animation look even better. Try adding an enveloped **Displacement Map** to the "WaterB1.lwo" object so that the water bubbles and roils as it is being poured into the second container. Also, the first container could have a few water droplets falling off of it after the water is done pouring.

The techniques used in this tutorial can be applied in many other ways. For instance, the "WtrPour.lwo" object, with stationary Bones and a moving displacement map, would make a nice waterfall effect. Or, if you changed the surface attributes for the water container objects to solid black and the "WtrPour.lwo" object's surface attributes to a glowing red, you would be pouring molten steel instead of water. But those are topics for another issue!

Since this was my first attempt at writing an article for *LIGHTWAVEPRO* (or any magazine, for that matter) I hope you found it informative and easy to follow. If you have any questions or comments, please don't hesitate to contact me at the e-mail address listed below. Thanks for tuning in!

LWP

David Warner runs the LightWave and Video Toaster mailing lists on the Internet and can be reached through e-mail at dwarner@albany.net. He also happens to be legally blind and yearns for the day when LightWave will allow users to change the interface colors.

Editor's Message

continued from page 3

LightWave install replaced some system dll's with older versions (among them AVI32.dll). You can get AVIs to work again by replacing the AVI32.dll with the version from your Windows/NT install set. (Look in the system or system32 directory for this dll.) Some installs had problems with not being able to find a dll called MSVCRT20.dll (usually under NT 3.51). You can copy the dll by hand from the LightWave CD-ROM (WIN_NT directory) to your system (or system32) directory.

For a list of dll's that the LightWave install has copied, simply read the Logfile.out text file left by the install script. The dll's are listed at the end of it.

CONT16 vs. CONT32: If you installed LightWave in a Windows 95 or NT computer, you'll most likely notice that it installed the CONT16 files (8.3 file names). I'm told that this is due to the Microsoft setup program that was used. If you haven't installed LightWave yet on a non-Amiga machine, do yourself a favor and deselect all of the content—only install plug-ins. Then copy all of the content directly from the CONT32 directory. This way you'll end up with long filenames.

Until next month...

John Gross
Editor

LWP

lwpro@internet.online

Lessons for Electronic Patriots

by Dan Ablan

I can't seem to believe what's happened this past year when it comes to the whole "information superhighway" thing. Just a year and a half ago, I was egged on by my brother, Mr. Big-City programmer, to get an e-mail/Internet account. (He's been doing this on-line thing for years now.) I figured I didn't really need something like that, and it seemed kind of frivolous. Still, I purchased an old 2400-baud modem and started calling BBSs from my trusty old Amiga. Before long, I thought, "Hey, this is pretty cool!" I was able to dial a slew of Amiga BBSs, and moreover, LightWave BBSs. I could download textures, images and upgrades to my Personal Animation Recorder, and I could locate free objects. All of this was just in the Chicago area; the thought of what I could find nationally with a World Wide Web account was mind-boggling. It seemed that I was being transformed from a video dork to a computer geek, all with the click of a mouse.

OK, You Win...

So, I gave in and got an Internet account and e-mail address from a local service bureau. Now, this was before the whole PC thing affected LightWave, and consequently, I didn't have a PC yet (well, at least a decent one). I hooked up the modem to my Mac and found a whole other world waiting just a phone call away. Since then, the 2400-baud modem has given way to a 28.8, and my nightly Net-surfing now takes place from a Pentium. I look back from time to time and wonder what my days would be like without the Internet and, of course, e-mail. Not only has my connection to the masses provided information for this column, it's helped me complete jobs more quickly! Recently, I got a call from a good friend in Los Angeles who is a graphic artist. She has been doing quite a bit of work for Warner Brothers, and her latest project was to design the *Babylon 5* Web site. She was just about finished with the project and was ready to go on vacation when Warner Brothers decided to make the main menu graphic 3D, rather than the traditional 2D art that the company had been using for the rest of the site. The project needed to be completed in three days, which meant that my portion was needed in about a day and a half. There was no time for overnight delivery, so I was e-mailed the 2D test image. I got to work, and in a few hours, e-mailed back a sample 3D image. By the next day, Warner Brothers and its associated *B5* staff looked at the test, made a few changes and e-mailed me back. By the end of the day, the final image was e-mailed to the studio for inclusion in its Web site.

This past March, through the same graphic artist in Los Angeles, I was contracted for an animation project for *Newsweek* Television. Of course, there was a four-day deadline. This meant that I only had three days to work on the project, since I'd have to overnight the final BetaSP tape. But there wasn't enough time to overnight a test render. By using WaveMaker's storyboard feature, I created a nine-panel overview of the final animation, e-mailed a JPEG image from Chicago to California, had changes and approvals made in less than an hour and was able to get the project done by the deadline. Again, I wonder how things would be without this whole Internet revolution.

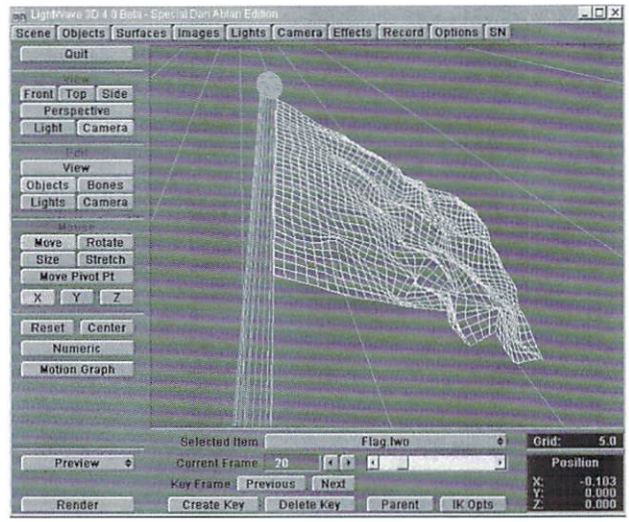

Figure 1: Add a ball to the top of the flagpole.

The LightWave List

With my subscription to the LightWave mailing list, I'm always amazed at how many e-mail messages come through each day. If I don't check my e-mail in just two days, I often get over 100 messages, 95 percent of which are LightWave-related. The majority are to the subscription list, but quite a few are sent directly to me from *LIGHTWAVEPRO* and *Video Toaster User* readers with comments and questions about recent articles, or just LightWave-related stuff. By the same token, when I recently took a break from checking into the LightWave newsgroup, I returned to find over 700 posts, all about LightWave.

As I read through messages, comments and questions, I make note of what would be good material for this column. There's been a lot of conversation about file transfers between Amiga and PC, LightWave 4.0 final shipping dates and the like, but it's good to find topics that can be made into mini-tutorials to help *LWPRO* readers, whether they're connected to the Net or not. This month, I've got two related topics, both of which are suitable for explanation. The first one is about using displacement mapping with Bones, and the second is a brief explanation of displacement mapping. A LightWave user was trying to add falloff with a waving flag and then wanted to add Bones to gain an extra random flapping motion. Great idea—LightWave to the rescue!

Salute the Flag

To create a decent flag, you'll need to build it with many segments on the X and Y axes.

- Go into Modeler. Using the Box Numeric tool (Objects) and a 500 mm grid, enter these settings:

	Low	High	Segments
X	-2.7 m	2.7 m	40
Y	-2 m	2 m	32
Z	0 m	0 m	1

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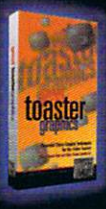

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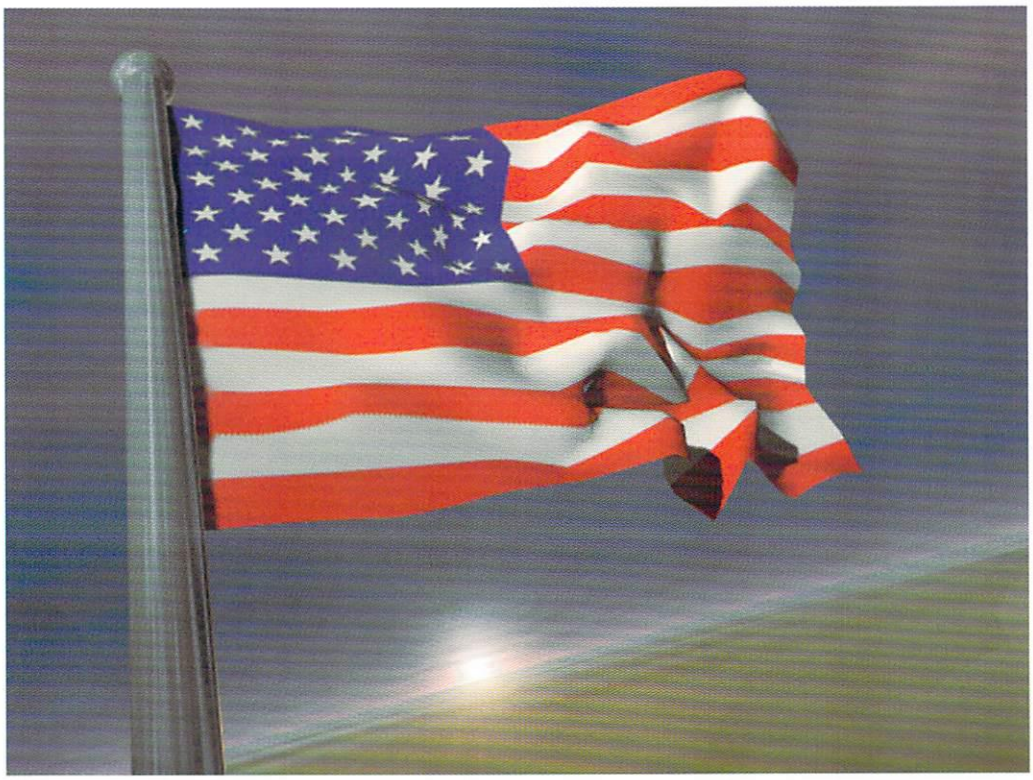

Stars and Stripes Forever

Old Glory waves proudly thanks to a fractal noise displacement map and Bones. See "lwpro@internet.online," page 10.

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A Shock to the System

A frame of the final "VU Meter Vibes" animation. See "Sending Out Good Vibes," p. 12.

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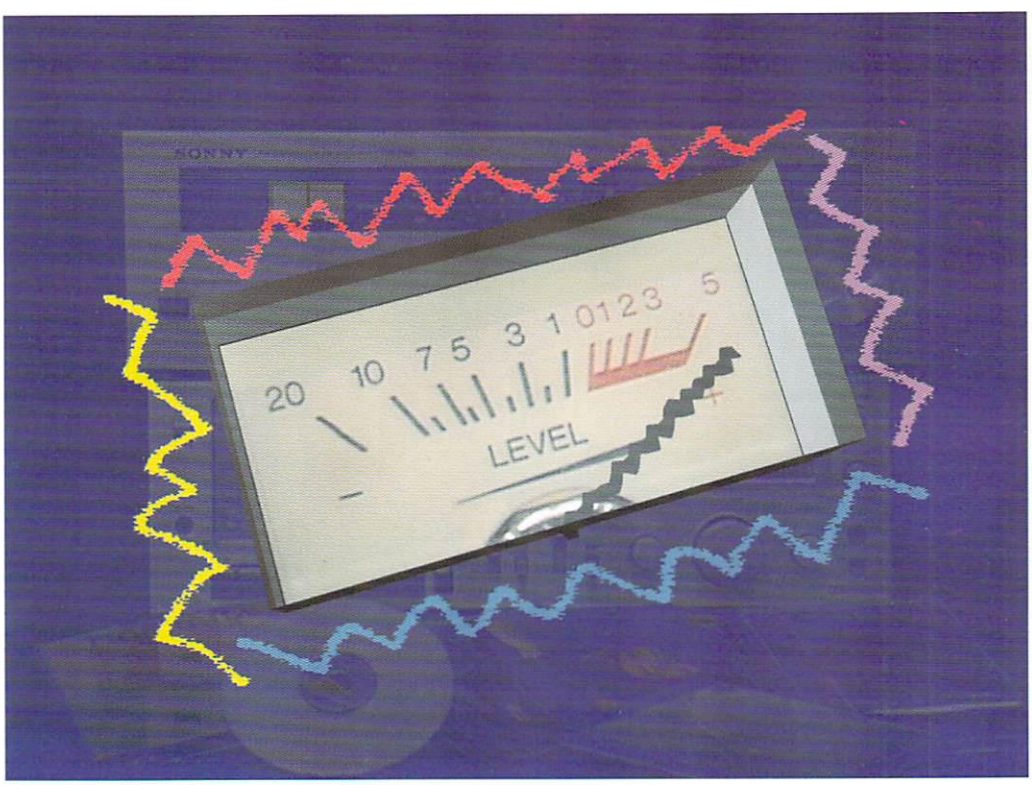
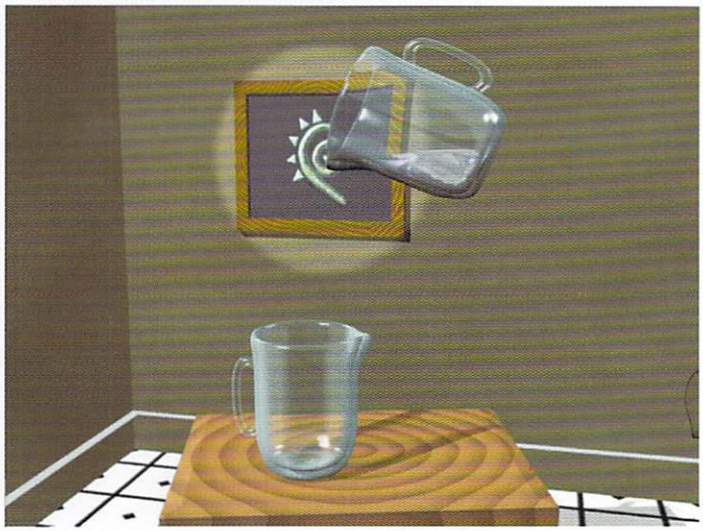




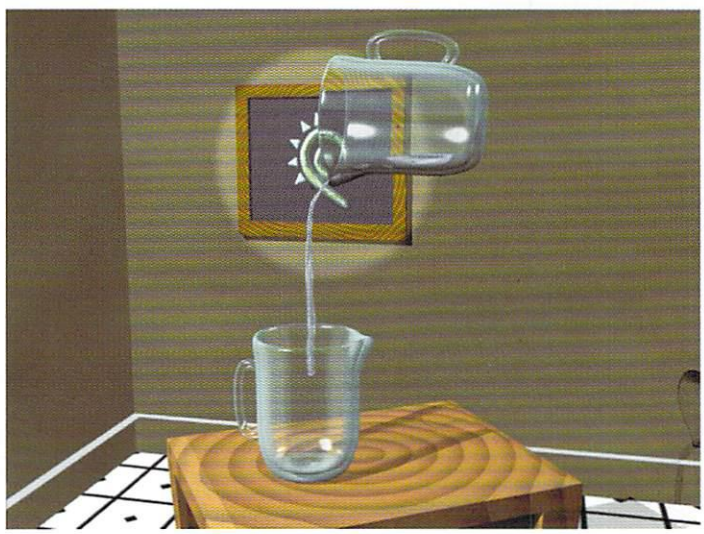
Let It Pour!
Frame 175

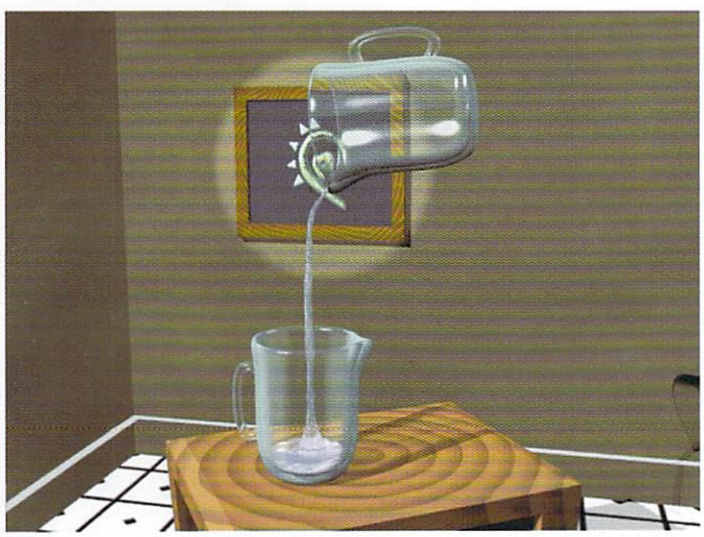
The container is about to pour the water. See "Let It Pour!" page 4.

All "Let It Pour!" images copyright ©1995 David Warner

Let It Pour!
Frame 225

The water pours from one container to another. See "Let It Pour!" page 4.





Let It Pour!
Frame 275

The pouring water has started to fill the upright container. See "Let It Pour!" page 4.

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LightWave 4.0, you can use the center function (Custom button, Objects), but if you're using the pre-release version on the PC, just visually center the flag. Now, save this object.

- Next, in layer two, with layer one in the background, make a flagpole. From the Y (top) view, draw out a disc to make a flagpole, and then enter the following in the Numeric requester:

Sides	16
Segments	1
Bottom	-5.1 m
Axis	Y
Top	2.25 m
Center	-2.95 m, -1.42 m, 0.0
Radii	150 mm, 3.675 m, 150 mm

- Add a ball that's slightly larger than the disc to the top of the pole, as shown in Figure 1, and save the flagpole.
- In Layout, load both objects. Parent the flag to the pole, and set up a decent camera angle. I often prefer a wider camera angle to accentuate the 3D element. A zoom factor of 2.2 is good.

I'm Feeling So Displaced

Now the displacement mapping begins. This relates to the second topic that's been floating around the LightWave lists on the Internet. Some users were posting questions about displacement maps and bump maps, and the difference between the two. So, a brief, non-technical explanation: A bump map simply alters the appearance of an object, either procedurally, as with fractal noise, or through an image map. Displacement mapping, on the other hand, physically alters the points of an object. You can even use displacement mapping as a modeling tool with LightWave's Save Transformed feature. With that in mind, let's displace the flag. Because we built it with so many segments, a displacement map will work nicely. If we were just bump mapping, the highly segmented flag would be a waste of polygons. Generally, unless I'm going for a specific look, I use the ever-wonderful fractal bumps for displacement mapping.

- Under the Objects panel, in Layout, select the flag as the Current Object, and click the little (T) button beside Displacement Map. Enter these settings:

Texture Type	Fractal Bumps
Texture Size	0.6, 0.4, 0.1
Texture Falloff	2.5, 0, 0
Texture Center	1.0, 0, 0,
Texture Velocity	.04, .018, .01
Amplitude	0.3
Frequencies	1

When you click OK and get back to Layout, you should see something like Figure 2. This is the flag before any Bones are added. Not bad. If you make a preview, you'll discover that the motions can use a little something extra.

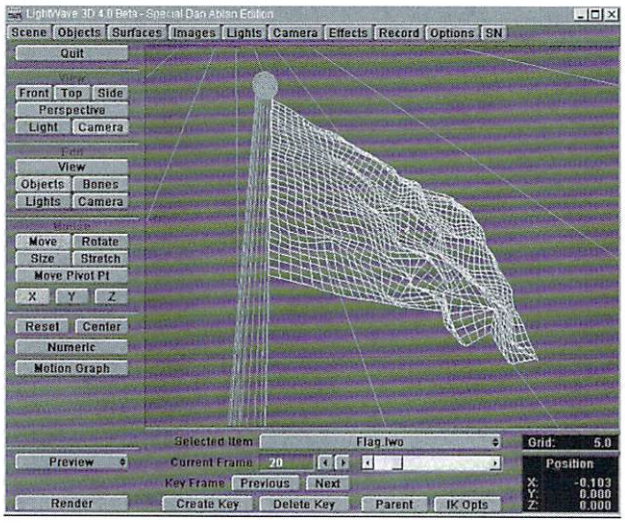

Figure 2: The flag is bent using a fractal noise displacement map.

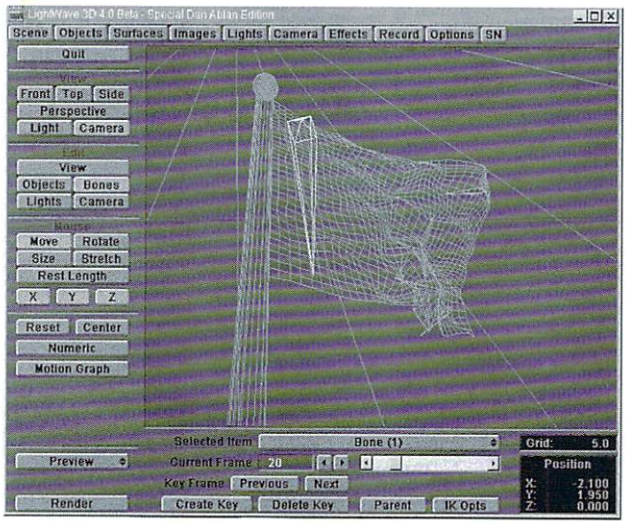

Figure 3: By adding three Bones to the flag, you gain an extra animation element.

Construction Work

- In Layout, make sure the flag object is currently selected, then enter its Skeleton panel by choosing Bone as the Edit Item and hitting (p) to shortcut into the panel. Conversely, you can select Object Skeleton from the Objects panel when the Flag object is picked as the current object.
- Add three Bones. Place one at the top right corner of the flag. Place another at the bottom right corner. The third Bone is going to be an anchor. Rotate it 90 degrees on the pitch. Click the Rest Length button and increase the length of the Bone to about the height of the flag. Place it on the left side of the flag, as in Figure 3. Create a keyframe at frame 0 for all three Bones and make them active by selecting (r) for each Bone or selecting Bone Active in the Skeleton panel for each Bone.
- Now, all you need to do is move the Bones as you see fit and create keyframes for them. Given the velocity we set on the flag, Bone positions at every 10 frames or so works nicely. Move the top Bone forward, move the bottom Bone back and at the next 10 frames, move one Bone down, or maybe move it in. Play with the positions and you quickly see how well the Bones can help add a little something extra to your scene.

Remember that you won't need to move the anchor Bone; however, a slight rotation on the heading may add a bit more realism. Another great use for this whole technique is a floating piece of paper in the wind. Let's say you had a car speeding down a dusty road, or better yet, an alley. The car shoots by, turning up some dust and trash in the alley, and a piece of paper gets uprooted from its resting place near a garbage can. You can achieve this effect by subdividing a small, flat polygon and adding two Bones to either end. Add a small fractal displacement map, but instead of setting the velocity, turn on World Coordinates. This will allow the paper to ripple accordingly as it moves through the air. Combine the Bone movements with the object's movements and you'll lend a nice touch to your animation.

What's Next?

Next time, we'll discuss more comments and questions that pop up on the Internet channels and some cool Web sites to visit. If you have a Web site you think is worth taking a look at, e-mail me with the address. In the meantime, check out my most recent attempt at creating a web page at http://www.mcs.com/~dma/home.html. *VTU* and *LWPRO* also have a new WWW home page at http://www.portal.com/~amg.

I'm sure there are a number of you out there who feel like I used to—that getting "on-line" is not for you. Well, think again. There's a whole new world waiting for you, especially when it comes to LightWave, and it's just a phone call away. See you soon!

LWP

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Sending Out Good Vibes

Save Time—Combine 2D and 3D

by Wayne M. Cole

Any endeavor with a "learning curve" that lasts more than a few hours seems to take us through phases, and 3D animation is no exception. In fact, some would argue that being a 3D animator is like being a perpetual student: There are always new techniques to learn, new software releases with new features to investigate, and requests from clients for things you've never tried or even thought of before. And animators keep finding themselves returning to things they had learned before, but from a new perspective or for a new reason. It is like a helical path, of sorts—repeating certain lessons, yet always moving forward.

This phase-to-phase progression is often marked by a point at which the animator realizes that he or she has operated with a certain mind-set that is self-limiting. At that point, the way of progress is illuminated with the light of a thousand new possibilities for greater creative expression.

OK, so that's an exaggeration. Maybe it's just the one good idea that allows you to go home and get a good night's sleep instead of sitting at your workstation pushing points and lines around, trying not to doze off while you wait for a test render to finish. Either way, it can be pretty darn gratifying.

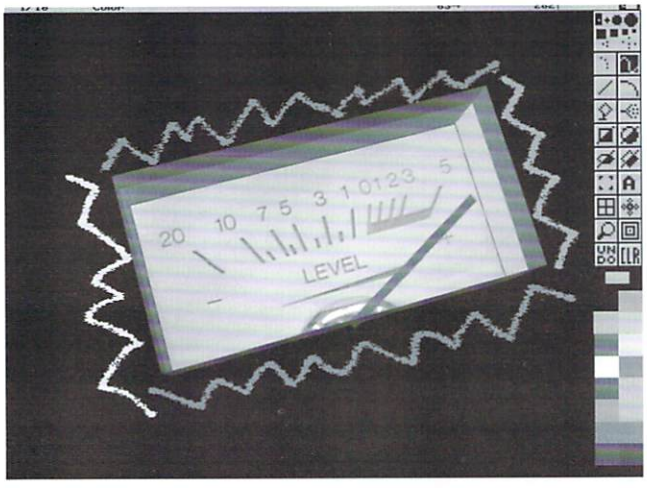

Figure 1: The VU meter from the Toaster's output is enhanced with animated lines created in DeluxePaint and then genlocked to Program Out.

"2D" Is Not a Dirty Word

Now, many 3D animators cringe at the sound of the phrase "2D animation" because their freehand drawing skills (mine included) are quite limited. But the truth is, many 2D animation features really don't require a Michelangelo touch to be of use to the 3D animator. Also, many 3D animators get so immersed in 3D that they miss opportunities for time-saving, or even project-saving, ways to combine 2D with 3D or live video. The basic oversight we make is that all our creative sweat and vision ultimately ends up on a 2D surface anyway. Often, using some 2D mixed with 3D can actually save time in both the modeling and animation phases of the project, and reduce rendering time for the final animation. If it's done well, nobody will be able to tell the 2D part from the 3D part.

Vibes and VU Meters

I was recently in a local producer's office when he received a phone call from one of his clients, a local rock radio station, who was shooting a promotion to be aired on local TV. The cameraman/editor described one scene where he wanted to add animation to 16-millimeter film footage after it was transferred to video. The scene involved a VU meter that zoomed up to the screen with the needle jittering around a number suggestive of the station's frequency while outrageous guitar riffs blasted in the background. The producer wanted to add "MTV-like scratchy lines" vibrating about the VU meter. The cameraman/editor wanted the effect done in LightWave.

The 2D Solution

I could see that his approach was going to be unnecessarily costly in both time and effort. The line construction would be no problem, but care would be required to ensure that a large enough set of tripled polygons was used to prevent surface breakage when the lines were deformed into those wiggling electric "vibes." Then there would be the matter of constructing morph targets, displacement maps or Bone sets to deform the lines, and creating the keyframes. And I could envision the endless futzing to give the lines just the right look. I immediately started thinking of 2D ways to approach this problem. Ultimately, there would be a LightWave 3D animation, but all the work except the final render could be done using Electronic Arts' DeluxePaint IV.

The basic process hinged on being able to use a DeluxePaint animation of the "vibes" on a black background as both a foreground image sequence and a foreground alpha key sequence in LightWave. This approach allows everything that appears beyond LightWave's hither plane (the viewscreen, in effect) to show through in the black areas of the DeluxePaint animation. It also paints the non-black portions of the DeluxePaint animation onto the hither plane blocking the view of whatever may be behind it.

I did a little experiment to demonstrate the concept. I created a VU meter mock-up in LightWave Modeler (essentially a box with one side transparent and the other side luminous with the image of a VU scale painted on it). I placed the VU meter in the scene using LightWave Layout, then rendered the frame in square pixel, 640x480 resolution. (The reason for choosing this mode will become clear in a moment.) Next, I exited LightWave and the Toaster, which left the Toaster Genlock active and superimposed the Amiga native display on the Toaster's program output channel. Here's where the 640x480 size comes into play. DeluxePaint's largest page size is smaller than the Toaster's D2 overscan size. Knowing this ahead of time, I chose a picture dimension I knew DeluxePaint could accommodate easily. Using a page size of 640x480 and the VU meter image that was still present on the Toaster's Program Out for positioning purposes, I created animated lines in DeluxePaint that were accurately positioned to frame the VU meter (Figure 1).

I decided to go "over the edge" a little, as that seemed to be the preferred "MTV" style the producer

had in mind for this scene. So I chose Deluxe Paint's airbrush tool (a euphemism for what I call the "paint splatter" tool) to form an irregular line suggestive of a lightning bolt to the left side of the VU meter box. With the cursor coordinates turned on, I picked up a copy of this line as a brush, while noting the width and height of the area cut out with the Brush tool. I then saved the brush to the spare brush buffer and copied the current picture buffer (one yellow lightning bolt on a black background) to the spare picture buffer.

Next, I turned on DeluxePaint's LightTable feature, which shows a ghosted image of the spare picture buffer "behind" the current picture buffer. Then I chose a new color (dayglow fuchsia) and drew another lightning bolt over the image of the original one showing through on the LightTable display (Figure 2). The key was to make the second line about as long as the first but to have at least 50% of the zigs head in the other direction. That is, where there was a peak to the left of the line's center in the original, I would paint the new line to peak to the right about half the time. The rest of the line was painted in a random fashion so that the final line would not look like a perfect derivative of the first one.

At this point, I selected the Brush tool and picked up the new line with the right mouse button, being careful to use a cutting region with the same width and height as the original. Then, in the DeluxePaint Brush menu, I selected the Spare/Morph option. A requester popped up asking for the number of frames over which to complete the morph from the line in the spare brush buffer to the line that was the current brush. I chose six frames. At this point, DeluxePaint created an animated brush that was a six-frame morph, and attached it to the cursor for use in painting. I saved the brush as VUMLinesL1.anbr (left side, first line, animbrush).

I then went around the other three sides of the VU meter making similar animbrushes and saving them until I had four distinctly different ones. Just for added effect, I varied the start and end colors for each one. Then I was ready to create the animation of the vibe lines that would form an electrically dancing frame around the VU meter.

In DeluxePaint's Animation Settings menu, I selected 10 frames for the animation length. Here's where the choice of six frames for the animbrushes comes into play. To get twice the animation for my effort, I decided to ping-pong the animbrushes when I painted with them. Ping-ponging would essentially play frames 1 through 6 of the brush, then frames 5 through 2, and repeat that sequence for as long as I painted with it. Now if you count that sequence out, you come up with 10 frames. Who said animators can't count?

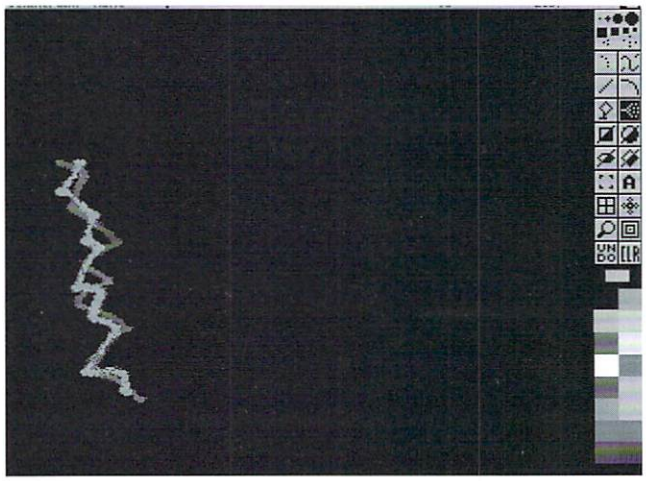

Figure 2: DeluxePaint LightTable display used to align first and last animbrush frames for the animated VU meter left side vibe line.

Starting with a clear screen, I loaded the first animbrush and, referring to the Amiga output overlaid on the Toaster Program Out, I positioned the brush image (the image of frame one of the brush, actually) adjacent to the VU meter image. I pressed the Alt key and left mouse button at the same time. (This keying causes DeluxePaint to lay down one frame of the animbrush on the current frame of the animation, then advance both the animbrush and the animation frame counters by one. This process is repeated as long as the Alt–left mouse button combination is maintained.) As each frame advanced I would move the brush a few pixels up or down and left or right to give a slight randomness to the placement of the brush in each frame. After the animbrush was painted on the 10th frame, I released the buttons and stopped the painting. I saved the animation at this point. Then I repeated the operation of loading the next animbrush, painting on the 10 frames adjacent to the corresponding VU meter edge and saving the animation.

After painting all four sides in this manner, I played the animation, choosing a looped playback

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Tip of the Month:

LightWave's Frames Per Second input field in the Scenes panel does not make any noticeable changes (with one exception) to any funtions in LightWave. It is merely there to tell LightWave at what speed you wish your textures to move. For instance, you may have set up a scene at NTSC video rates (30fps) using moving textures (Texture Velocity), and later decide that this animation will be output to film (24fps). If you left your Frames Per Second setting at 30, your textures would appear to be moving too fast. Adjusting the Frames Per Second setting to 24 would move the textures at the proper velocity.

If you set the Frames Per Second value to 25, however, you instruct LightWave to play previews back at PAL rates (25fps as opposed to 30fps). You'll even notice that the Preview playback buttons are in PAL increments.

Here's the tip: If you are animating at 24fps, but feel that the 24fps playback in the Preview Playback requester is a little too jerky, try setting your Frames Per Second value to 25 and play back your preview at 25 fps instead. This rate is often a bit smoother and will be close enough, timewise, for tests.

Figures 3a and 3b: The start (a) and end (b) frames of the Background Image fade sequence.

mode so I could watch the animation over an extended period of time to look for any elements I might want to change. (All right! So I just wanted to admire my handiwork for more than a third of a second!) Figure 1 shows what the program output looked like with the first frame of the DeluxePaint animation genlocked over the rendered VU meter mock-up.

The next step was simply to choose Save from the Project menu. In the Save Frames requester that DeluxePaint presented, I set the range to be from 1 to 10. This has the effect of saving 10 distinct pictures, whereas selecting Save from DeluxePaint's Anim menu saves the dynamic, "sewn together" animation.

Finally, as a last step, to ensure that these pictures would line up correctly when applied to the final animation, I used ADPro to scale them back to 752x480.

LightWave Without Objects

Fortunately, DeluxePaint names these saved frames with a convention that is compatible with LightWave: basenamexxx, where xxx is the frame number. In this case, my file names ran from VUMLines.001 through VUM Lines.010. So I had 10 frames of animation to cover a three-second (90-frame) segment. Well, here's where another handy feature of LightWave enters the picture.

When you load an image sequence into LightWave using the Layout module's Images menu, you have the option of telling the software how much of the image sequence to loop. For this project, I chose to loop all 10 frames so that the sequence would run nine times over the course of the finished segment.

The "planned" finishing touch was to composite the 2D animation with the actual VU meter footage. I envisioned using the Toaster and Nucleus Personal Single-Frame Controller to capture the individual frames of the VU meter scene to disk. Named as described above, I would have had a 90-frame image sequence of the VU meter. In LightWave's **Images** panel, I could then load this sequence without looping enabled. From the **Background Image** pop-up menu (**Image Compositing** panel in 4.0) in the **Effects** panel, I could select the captured VU meter frame sequence. For both the **Foreground Image** and **FG Alpha** Image pop-ups, I would select the VUMLines sequence created in DeluxePaint.

Jumping over to the **Record panel**, I could select the location to save the individual images of the animation I produce in LightWave. Then, on the **Scene** panel, I would set the animation to run from 1 to 90, and after clicking the **Render** button and the **Automatic** frame advance mode, clicking the **OK** button would produce the final product. On a lowly 33 MHz 68040 Amiga, the finished animation would be ready in about 90 minutes. If I were to use LightWave with ScreamerNet on a MIPS CPU, Windows NT LightWave on a Pentium, or a MIPS- or DEC Alpha-based workstation, the finished product would show up in roughly six to nine minutes. It would take only another 15 minutes to go from single-frame to tape. Or, using DPS's Personal Animation Recorder card, Perception card or the Video Toaster Flyer, the animation could be laid to tape in real time along with an audio track.

There you have it: a LightWave 3D animation with no 3D objects in it, but rather the composition of two 2D animations, in effect. Not a traditional use of either 2D or 3D animation to be sure, but a cost-effective use that can allow a 3D animation house to accept projects that would otherwise be very hard to pull off in 3D alone.

LightWave Layering and Compositing

Notice that I used the term "planned" for the finishing touches. The 16-millimeter film footage of the VU meter didn't turn out as well as expected, and there was no time to reshoot, especially considering the time required to reprocess the film. So the producer chose instead to settle for some chroma FX flashing when the zoom to extreme close-up on the VU meter occurred.

But, after all the work I put into the project, I decided to, more or less, complete the job. (Actually, it was less than two hours of playing around exclusive of rendering time.) In the process, I found another use for the Foreground Image features of LightWave.

I set up a still medium shot of the receiver with the subject VU meter on it. Using ToasterPaint, I "surgically removed" the VU meter from the still and altered the visible brand name to avoid any possible copyright hassles. I rendered this image (Figure 3a) to disk, and it became the starting frame for a backdrop sequence. Using LightWave as an image processor, I produced a 30-image sequence where the image faded to a bluish, less distinct version of the original picture (Figure 3b). I did this by selecting the still in LightWave's Effects panel as a Foreground Image over a Solid Backdrop, with the background color set to 0, 0, 64. Then I set up a Foreground Dissolve envelope with a keyframe at 0 (0% dissolved and Spline Controls Tension set to 1.0) and a second keyframe at 30 with values of 80% dissolved, Tension equal to -1 and Bias set to 1.0. I rendered this scene after selecting Save RGB Images with the basename, VUMtrBkgFd., in Layout's Record panel.

3D With Vibes

With the VUMtrBkgFd still sequence loaded into a new LightWave scene via Layout's Images panel and selected in the Effects panel Background Image requester, I set the Options panel Layout Background option to Background Image so I could see a ghosted image of the background on the Layout screen. Then I loaded, positioned and sized my mock VU meter object to cover the space once occupied by the VU meter in the original still (Figure 4). I set up a simple 30-frame fly-up of the VU meter over the fading backdrop sequence, which became the first second of the final animation.

Finally, I created the last scene—the "vibes" scene. I loaded the last frame of the background fade sequence, VUMtrBkgFd.030, as the Background Image and used the VU meter's final position from the fly-up as its starting position for this scene. I decided that it would look better to have the VU meter needle and the meter itself acting as if they were wracked by the same sonic onslaught that produced the vibes in the first

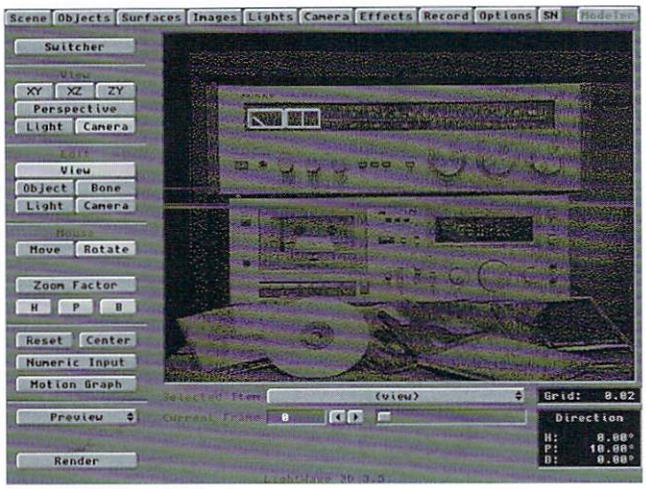

Figure 4: The result of positioning the VU meter objects against the Background Image in LightWave.

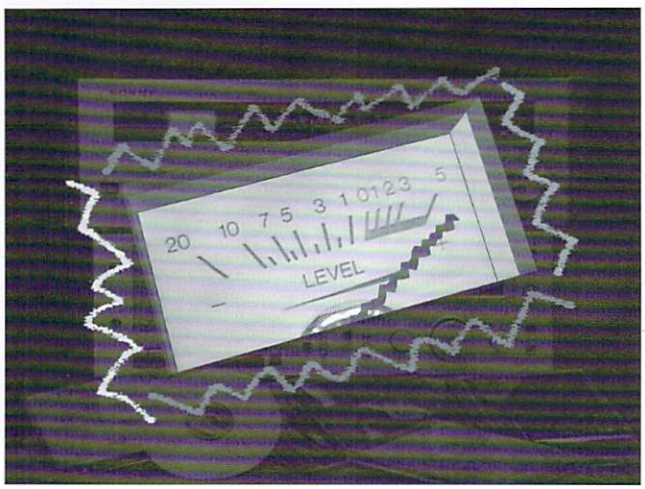

Figure 5: Frame 2 of the final "VU Meter Vibes" animation.

place. So I gave the meter needle an accordionlike motion and made the meter itself dance in space a little by creating "random" variations in its bank angle and size. The IFF images saved from the DeluxePaint vibes animation were loaded as an image sequence and selected from the Effects panel as both the Foreground Image and FG Alpha Image. Again, the idea here is to use the black portions of the vibes images to allow the background and 3D animation imagery to "show through" the vibes images while painting the vibes lines on each frame of the underlying animation. Figure 5 shows how well this layering works.

Since the animbrush sequences (remember those?) were only 10 frames long, the animation only needed to be 10 frames long. This 10-frame sequence could then be looped without the appearance of a loop. I accomplished this by making sure that the variations in the VU meter needle crunching and the VU meter jiggles and stretches were not "in rhythm" within the 10 frames. For example, the frame in which the needle hit its minimum was not coincident with the frame where the VU meter's most counterclockwise bank or minimum size occurred. All three factors were varied randomly, in spite of the fact that they were all set back to their frame 0 position by the time the animation was on frame 10. The last step was to render this scene while saving the images.

The Final Take

The last step was to lay the two scenes (the VU meter fly-up scene and the VU meter with vibes scene) adjacent to each other on tape. The final 10-frame animation can be looped as many times as necessary to cover the time needed for that portion of the commercial. Titles can be keyed over the animation, or its frames can be saved and used as a background sequence in another scene that includes a 3D animated title, or perhaps a logo treatment.

LightWave Out of Character

For this project, I used a 2D paint and animation package to easily and quickly create an effect (vibrating paint splatter lines) that LightWave was not designed to handle. However, without LightWave's image sequence handling features, this project would not have been so easy. Although it was probably not the intention of the designers, LightWave can be an effective multi-frame image processor at times, as demonstrated in the creation of the fading background image. The software's image sequence feature also allows multi-generational layering that is, for practical purposes, without loss. The layering approach can save time and money by allowing a review of key elements of the finished project (like our animated vibe lines) well before all of its parts are ready to combine into the final animation (for example, the filmed footage of the VU meter). And these two "out of character" uses of LightWave—as image processor and compositor—mean that you can use it to create animations that don't have a single 3D object in them at all, and for combined 2D/3D animations featuring effects that cannot be done with 3D alone.

LWP

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LightWave 101

continued from page 7

Selecting **Knots** tells Modeler to place more emphasis along the areas of the curves that were made with a higher density of points (**Knots**), which, incidentally, usually occurs along bending areas. If you were patching around a curved 90-degree bend in a wall, using Knots would be a good choice.

Clean Up!

Let's undo that last test and repatch the mountain using a lower number of divisions. I used 20 subdivisions for each field and used Length for each field. Now that you've got your mountain shape, let's clean it up. If you wish, you can use the Mirror (Multiply) command to form the other side of the mountain. Be sure to merge points by pressing (m) after the mirror operation.

Modeler leaves the original curves in the object after patching is done. So let's get rid of them. Make sure nothing is selected prior to continuing.

- Enter Polygon Select mode.
- Push (w) to open the Polygon statistics requester. On the top of the menu you will see an area that says "Curves" and a number before it. This number tells us how many curves are in our object.
- Push the (+) symbol and Modeler will select these curves.
- Cut these curves and Paste them to another layer if you wish to save them for further use. Go back to the layer with your object.
- Push (w) again to enter the Polygon Statistics requester. On the bottom of the requester you should see a line of text that reads "Non-planar."
- Click on the little (+) sign. This will select all the non-planar polygons in our object.
- Now, use the Triple (Polygon) (t) command, which will convert the non-planars to triangular planar polygons. If a polygon is not planar, it can produce errors when rendered.

Onward! The polygon surface normals are probably pointing in opposite directions throughout various portions of the object. Why? If you used (f) to flip the curves during the patch phase this will also make the newly created polygons face the opposite direction. I had to use Flip once during the tutorial. Let's fix this!

Select some polygons in a horizontal fashion and you'll notice that some face inward and some face outward. Since we are modeling a mountain/mound shape, we want all the polygons to face outward. We

see LightWave 101, page 18

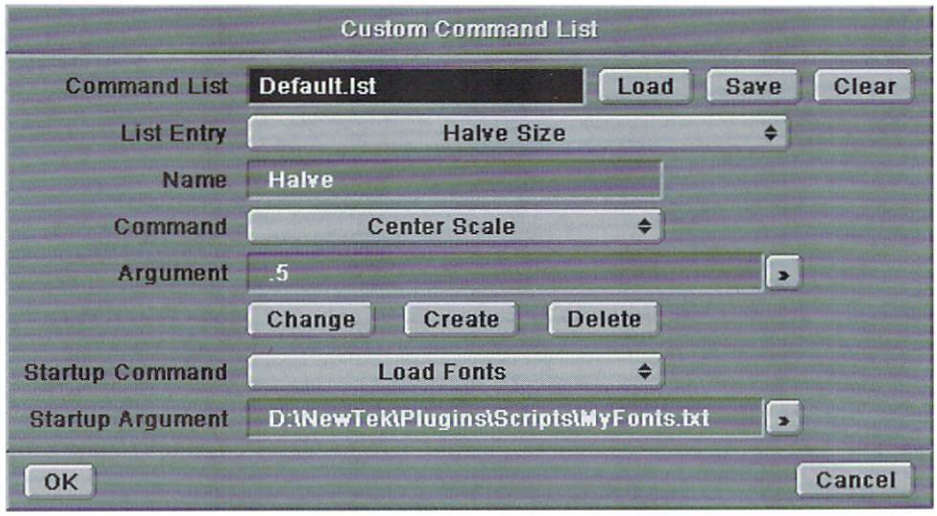
Customizing Modeler
Using the Custom Pop-up Menus

by John Gross

Though LightWave 3D 4.0's manuals are a great deal better than previous incarnations, there are still a few small oversights. One perhaps not-so-small oversight was the omission of a section for Modeler's User Guide about configuring its custom command pop-up.

If you know how to configure the macro list in Modeler 3.5, you will still need to learn a few new things, as the process has changed a bit for 4.0. There's a bit more power, but things can be confusing the first time through.

You'll have to excuse the following text if it starts sounding too "manual-speak," but I thought I would leave it more or less in the original form intended for inclusion in the manual. I will jump in where necessary with additional information.



The Custom Command List requester allows you to create custom commands and define lists.

Using the Custom Command Pop-up Menu

Selecting the **Custom** pop-up menu in the **Objects** panel allows you to choose commands from a list. They appear in the following manner:

(1) Modeler's built-in commands of **Configure List** and **Configure Keys.**

(2) User-defined commands (based upon added plug-ins).

(3) Modeler's built-in **ARexx/Rexx Script** command.

(4) Individual plug-in commands added through the use of **Add Plugin** (alphabetized by the actual name of the function, as opposed to any user-defined name for the function).

Depending on the command chosen from the **Custom** pop-up list, an operation will occur or a requester will be presented for you to supply values in order to perform a function.

Adding Plug-in Functions to Modeler

Selecting the **Add Plugin** command from the **Objects** panel's **Custom** pop-up menu allows you to select a third-party plug-in file. A plug-in file can contain many functions or commands. For example, adding the supplied CENTER.P plug-in adds seven commands: BoundingBox, Center, Center1D, CenterScale, CenterStretch, PointCenter and Symmetrize.

Note: When you first add a plug-in, the names of the functions that appear in the **Custom** pop-up will default to the name of the function as listed in the actual plug-in file. You can change these names by editing Modeler's config file, known as Mod-config (Amiga) or LWM.cfg (PC). If you use Add Plugin to try to add a plug-in that is already loaded, you will not receive any additional entries in the **Custom** pop-up menu.

Important: When you exit Modeler, any plug-ins added by the **Add Plugin** command will be saved to the configuration file and be available the next time you start the program. They are alphabetized in order of the actual plug-in function name as defined in the plug-in file, rather than by the user-defined name that appears in the **Custom** pop-up menu. If you do not edit the names of the plug-in file functions in Modeler's configuration file, these two names will be the same.

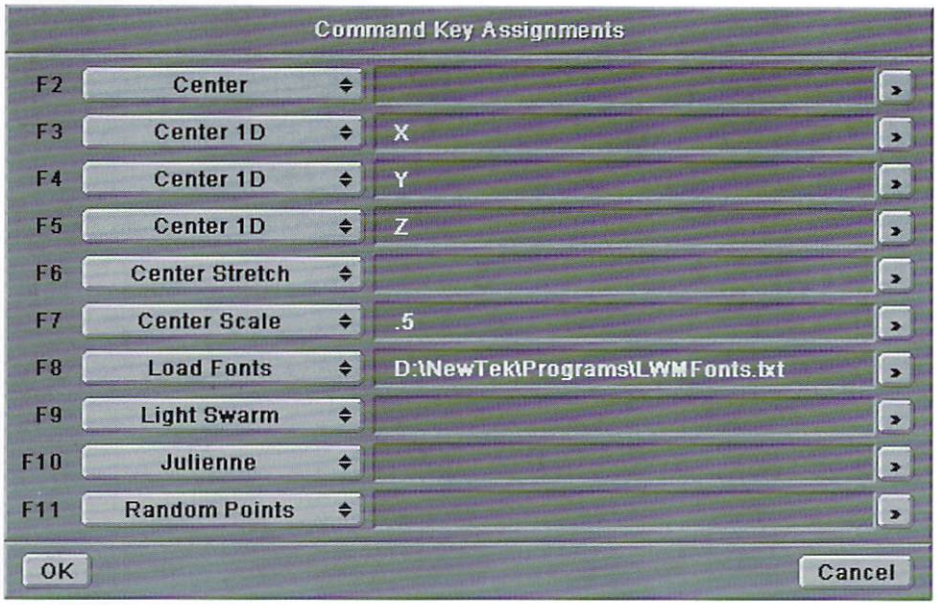
When you first run Modeler, no plug-ins have been configured. You will need to add the plug-ins (files that end in ".P") that are located in the Plugins/Modeler directory. After loading all of the Modeler plug-ins, you should have a number of entries to both **Custom** pop-ups in the **Objects** and **Tools** panels. Before doing anything else, you may want to quit out of Modeler to save the config file, so your plug-ins will be remembered the next time you start.

Tip: Before adding any plug-ins, you may want to change the PluginDirectory line in Modeler's config file to point to the path where the Modeler plug-ins are located. After you make the change, the **Add Plugin** requester will automatically point to that location. If you installed LightWave to the default NewTek directory (PC), this line would be changed to read:

PluginDirectory D:\NewTek\Plugins\Modeler

Creating and Configuring Custom Command Lists

Selecting the built-in Configure List command from the Custom pop-up menu in the Objects panel presents a panel allowing you to create and save custom commands. This panel will appear when you access the Custom pop-up menus.



The Configure Keys requester lets you set up keyboard shortcuts for your favorite commands.

Custom commands are generally based upon functions that allow some type of user input as an argument. For example, the CenterScale function allows you to run it with an argument that is simply a number defining the scale value. If you enter no argument, it defaults to 2.0, which doubles the size of the object(s) in the foreground layer. If you use an argument, the function will not expect any input from you (as it normally does) but instead will scale the object according to your argument value.

Creating/Changing/Deleting a Custom Command

To make a custom command, you must first have some plug-in commands loaded. If you followed the steps above for adding plug-ins, you are ready.

If you select **Configure List** and look at the Custom **Command** List panel that appears, you will notice that any added plug-in commands are listed in the Command pop-up menu. Some of these commands support a user-defined argument such as CenterScale. The Load Fonts command will accept, as an argument, the name of a text file containing the complete paths of font files to load when the Load Fonts command is selected. If no file name is given, the Load Fonts command looks for a file named LWMFonts.txt and will load the font files listed in there.

Any gray input field to the left of a button with a right arrow on it is an argument field. There are two of these fields in the **Custom Command** List panel and 10 of them in the **Configure Key Assignments** panel. You can select the right arrow buttons to find and select a text file containing arguments for the selected command. If the argument is an alphanumeric value rather than a file name (such as the CenterScale argument), you can simply input it in the **Argument** field.

The **List Entry** pop-up menu contains any user-defined commands and reads (None) if none have been established.

Let's say that you wanted to create a custom command that loads three font files that you use for a particular client. The steps you would use are the following:

(1)Create and save (ASCII/text format) a text file that states, one per line, the complete path name of the three font files you would like to load. If the fonts were located in a directory called Client in a larger PSFonts directory, the text file would look something like this:
D:\PSFonts\Client\Fontname1
D:\PSFonts\Client\Fontname2
D:\PSFonts\Client\Fontname3

(2)Select **Configure List** from the Custom pop-up menu (Objects) and select the **Load Fonts** command in the **Command** pop-up menu.

(3)Select the right arrow button to the right of the **Argument** field below the **Command** pop-up menu and use the requester to find and select the name of your text file containing the font names.

(4)Enter a name for your custom command (e.g., "Load Client Fonts") in the **Name** field above the **Command** pop-up menu.

(5)Click on the **Create** button to create the custom command. The List Entry pop-up menu will now contain this entry.

If you later wish to change the name of this custom command or the argument file, select it in the **List Entry** pop-up, make any changes to the **Name** or the **Argument** fields, and then hit the **Change** button.

If you would like to remove a custom command from the list, simply select it in the **List Entry** pop-up and press the **Delete** button. Note that this only removes a custom command, not a command added by the configuration file or **Add Plugin**.

Important: After changing or deleting a custom command, make sure to save your list if you want the changes to be permanent (see next section).

Tip 1: Read the documents provided with a plug-in file to learn which functions allow for user-defined arguments.

Tip 2: Using custom commands, you could build many different versions of the same command. For example, you may have different font files used for different working situations, each of which could be accessed by creating custom commands that use the Load Fonts command with different arguments.

Tip 3: List Entry commands appear alphabetized in order by the name you define. In addition, they appear in the Custom pop-up menu before any added plug-ins. To provide some order to the Custom pop-up menu, you may want to create some List Entries such as "----------" to start the list and "z----------" to end the list. Make sure to assign benign commands (such as Rexx Script) to these entries so any data will not be changed by accidentally selecting them.

Saving/Loading/Clearing Custom Command Lists

Once you have constructed a list of user-defined

What's on the Disk?

This month's disk includes scene files, objects and images from Dave Warner's "Let it Pour" and Wayne M. Cole's "Sending Out Good Vibes" tutorials.

custom commands, you can save the list by selecting the **Save** button near the top of the Custom Command List panel. You will be presented with a requester with which you can choose a directory and file name for the saved list.

Selecting **Load** will allow you to load a previously saved list, replacing the currently loaded list. Selecting **Clear** will clear any list currently loaded, leaving the **List Entry** pop-up set to (None).

Note: The last loaded list will be written to Modeler's configuration file and will be loaded automatically the next time you start Modeler.

Tip: You may have different command lists for different working environments or clients. Each may contain specific user-defined commands pertaining to a certain client/project.

Defining a Startup Command

The pop-up menu to the right of the **Startup Command** label allows you to choose a command from the list of added plug-ins that will be run every time you start Modeler. A commonly used Startup Command is the Load Fonts command. Below the Startup Command pop-up, there is an argument field that can be used for any argument(s) for the Startup Command. In the case of the Load Fonts command, you would want to select the name of the text file containing the font paths to be loaded.

Tip: If no file name is given as an argument for Load Fonts, it will look for a file named LWMFonts.txt and will load the font files listed in there by default. If no such file exists, no fonts will be loaded. LWMFonts.txt needs to be located in Modeler's working directory (the location from which you start Modeler).

Note: The selected Startup Command will be remembered the next time you start Modeler.

Configuring Function Key Commands

Selecting **Configure Keys** presents the Command Key Assignments panel. From here you can attach commands to your keyboard's function keys. On the Amiga, you can use F1 through F10. On non-Amiga platforms, you can use F2 through F11 (F1 is reserved for Help key shortcuts).

Selecting an added command from any one of the 10 pop-up menus will assign it the appropriate function key. To the right of each pop-up menu is an argument field to input any user-defined argument (e.g., a text file or an alphanumeric value). To assign three commands that will center any items in the current layer along the X, Y or Z axes, perform the following tasks:

(1)Choose the Center 1D command from the pop-up menu corresponding to the function key you would like to assign this function to.

(2)Enter X in the argument field to the right of the chosen pop-up menu.

(3)Repeat the process twice more for two more function keys, entering Y and Z, respectively, for the two argument fields.

(4)Select OK to return to the main Modeler screen. Choose one of the newly added function keys. Object(s) in the foreground layers will be centered along the appropriate axis.

Tip: If the Center 1D command is used without an argument, a requester will ask you to choose which axis to center the object upon.

Note: Any changes to the Command Key Assignments will be saved when you exit Modeler and will be ready for the next time you begin a modeling session.

That's about it. You should now have a pretty good feel for configuring your own lists using Modeler's Configure List command. You may notice some little downfalls in this whole custom list thing. For example, I believe that only the functions appearing in the **List Entry** pop-up menu should appear in the Custom pop-up menu. With the current version, all of your custom commands are listed (alphabetized by user-supplied name in List Entry), followed by a list of all of the functions (alphabetized by function name in plug-in file). I feel that, by default, all of the added plug-in commands should be listed in the List Entry by their default names (and in the **Command** pop-up menu of the **Custom Command List** requester). This way, you, as the user, could define the order of all of the functions by simply renaming the List Entry to alphabetize them.

LWP

John Gross is the director of special projects for Amblin Imaging and the editor of LIGHTWAVEPRO.

LightWave 101

continued from page 15

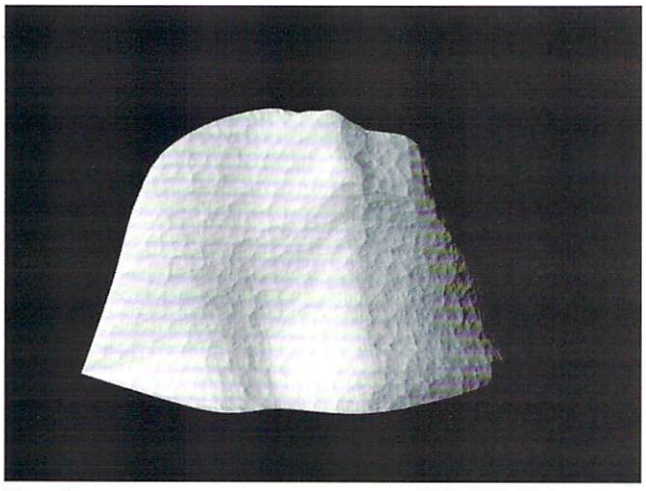


Figure 5

do this in Polygon Select mode.

- Deselect all polygons by clicking in a gray area that is outside of the Modeler grid.
- Use the Align (Polygon) command. This will make all the polygons face one direction. The only problem is that we do not know in which direction they will face!
- So click on some polygons. If you see that they are facing inward, push (f) to flip the polygons outward.
- Save the object. (Note: I noticed in the pre-release Intel version that the Align command may not always function properly if a merge points operation is not performed first. This is usually not the case.)

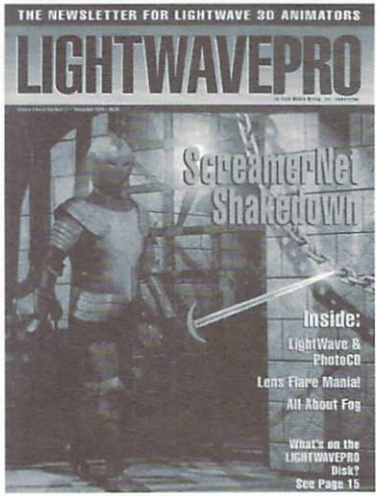
Let's See It!

Load the object in Layout. I used the default surface and added a texture bump map. I then used the Crumple Bump Map texture with three scales and a size of 0.25 on all axes. Leave the amplitude at 50%. If your version doesn't have this texture, use Fractal Bumps with a higher amplitude setting and a texture size of 0.08 on all axes. You may leave Smoothing on or off. I like it off.

I hope that you feel more comfortable with patching splines. Keep practicing, because in the next article we will be using these tricks and a few new ones to create a complex object using multiple splines. If you have any other suggestions or questions, please e-mail me at adamchry@cats.ucsc.edu.

LWP

Adam Chrystie is a cinema/video major at the University of California, Santa Cruz, who is sweating over the completion of his demo reel. He'll be graduating soon and is looking forward to returning to the pro animation world. He loves music of many forms, biking, cultural festivals, studying languages and hanging out with friends while having nighttime beach bonfires.



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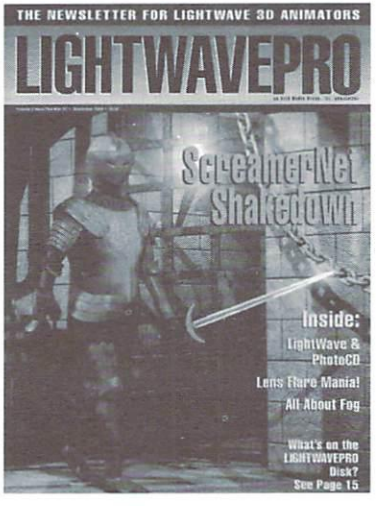

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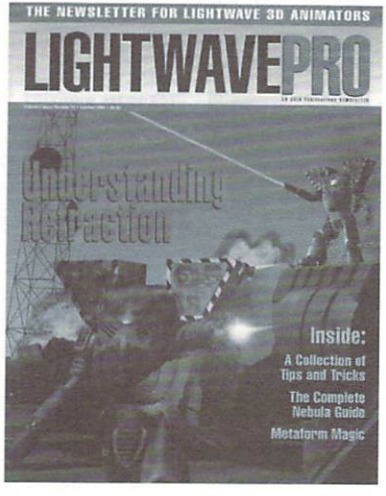

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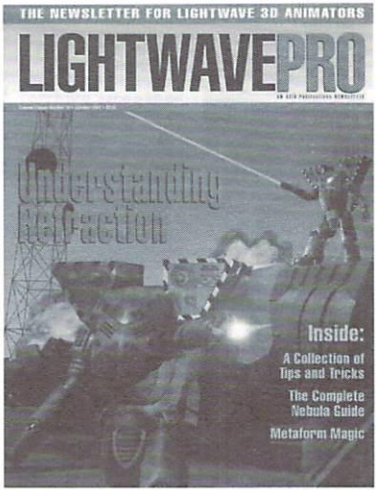

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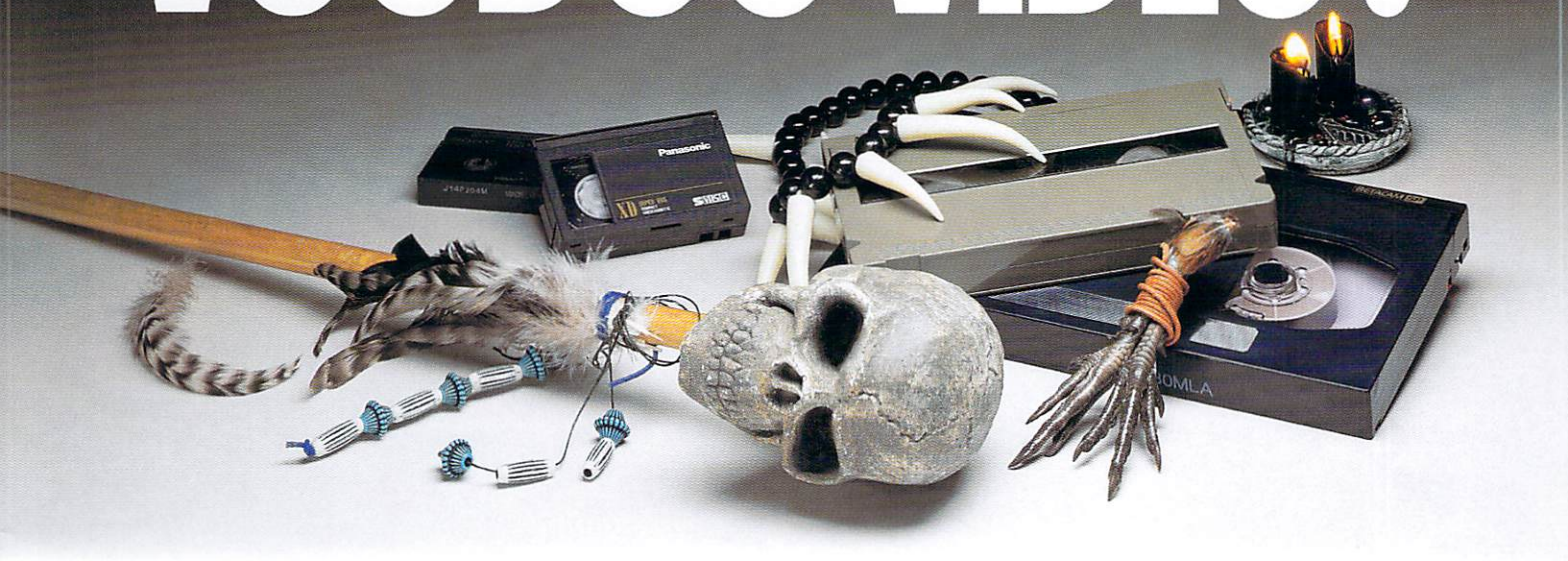

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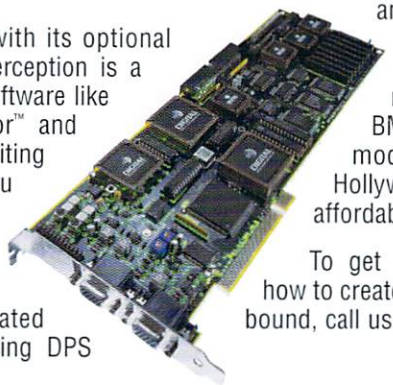

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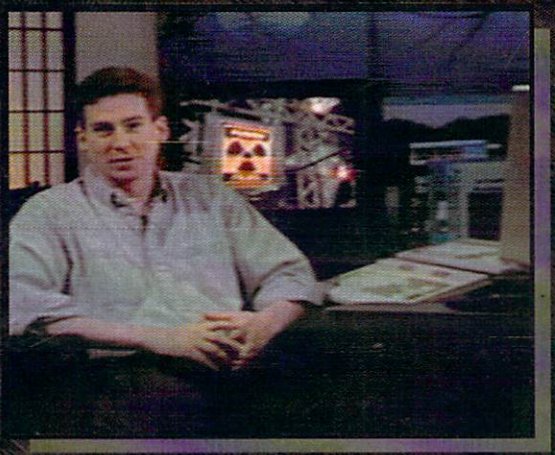

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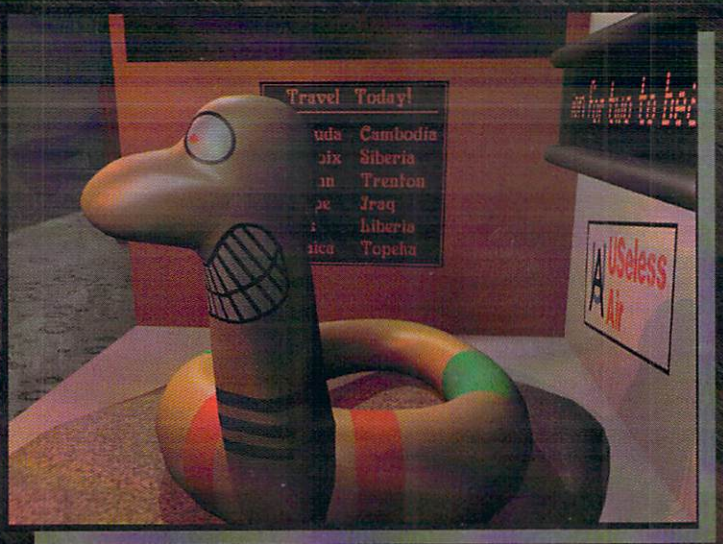

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